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TRADE AND DEVELOPMENT: A THEORETICAL
DISCUSSION

by

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A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Trade and Development: A Theoretical Discussion", submitted by Manfred Joachim Sturm in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

The interest in the economics of underdeveloped countries in recent years has provoked a reconsideration of many aspects of the theory of trade and welfare and has led to considerable criticism of the relevance of the neo-classical framework. So far we have only fragments as no systematic revision of the theory has as yet emerged. The pure theory has concentrated on the determinants of the volume, terms and pattern of trade and on the connections between trade and the economic structure of trading countries. Since the dominating development in pure theory during the period considered has been the elaboration of the Heckscher-Ohlin trade model, and since this model goes behind comparative advantage and shows the link between a nation's economic structure and its trade, the thesis takes this model as the convenient starting point. The relevance of this theory, primarily its assumptions, to an underdeveloped country is then examined. Clearly in this respect the static theory is certain to be less relevant, and this is true not only when it is applied to growing underdeveloped countries but also when it is applied to growing developed countries. On the whole, the view of this thesis is that the standard trade theory, when properly modified and applied but not radically altered, can provide a

framework for the analysis of trade and the development policy of underdeveloped countries as much as of advanced ones.

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION AND BACKGROUND

1. Introduction

During recent years, a rich literature has grown up on the theme of the inter-relations between economic development and international trade.¹ Indeed, this has led G. Meier to assert that discussions of the interaction between trade and economic development require greater 'analytical coherency', clarification of central issues, and 'consolidation of major insights'.²

Classical and neo-classical economists point to the benefits that the rising industrial nations of the 18th and 19th century gained from foreign trade. Their doctrine of comparative costs stresses the gains from trade that result from a better allocation of world resources. Foreign trade widens markets, promotes the division of labour, stimulates capital accumulation, yields external economies, and intensifies competition. All of this is conducive to development.

¹T. Bhagwati, "Growth, Terms of Trade and Comparative Advantage", Economia Internazionale (August, 1959), p. 393.

²G. Meier, International Trade & Development (New York: Harper & Row, 1963), p. xi.

Classical and neo-classical economists emphasize the mutually beneficial nature of trade to both industrial and non-industrial nations resulting from specialization according to the comparative advantage principle.

In western countries today some widely accepted doctrines of trade and development are still to a fairly large extent influenced by the experience of the 19th century. The classical trade theory derived a great deal of prestige from the brilliant record of 19th century trade and development "even though it paid little or no attention to an essential aspect of that experience, namely, the dynamic spread of economic growth through trade".¹ It was Sir Dennis Robertson who observed that trade was truly an 'engine of growth' in the 19th century.

A. Marshall declared, no doubt under the impression of contemporary experience, that "the causes which determine the economic progress of nations belong to the study of international trade".²

In order to comprehend the problems of economic development of underdeveloped countries, it is not sufficient to look backwards over the historical experience of the industrialization process. Economists must also cast their thoughts inwards to the very fundamentals of international trade theory.

¹R. Nurkse, Patterns of Trade & Development (Stockholm: University of Stockholm Press, 1959), p. 14.

²A. Marshall, Principles of Economics (8th Edition, London: Macmillan & Co. Ltd., 1961), p. 270.

2. The Object of the Thesis

The object of this thesis is to examine some of the differences between developed and underdeveloped countries which might make the pure theory of international trade, still known as the doctrine of comparative advantage in contemporary economics, more applicable to one group of countries than to the other. The study centers to some degree on an examination of the assumptions upon which the comparative advantage principle rests, in relation to underdeveloped countries. The approach will be to recognize that the international economy is composed of countries with different levels of development as measured by per capita real income. Some of the basic characteristics and structural differences of developed and underdeveloped countries will be outlined. It will further be recognized that the several countries are experiencing different rates of development over time. Moreover, "each country's pattern of internal development may vary, in accordance with particular leading and lagging sectors and different interconnections between the sectors".¹

Next, the postulates of the pure theory of international trade will be stated and the model developed. Once we have recognized the different levels and patterns of development, we must transform some of constants in trade theory into variables.

¹G. Meier, op. cit., p. 4.

In the context of development, we can no longer allow resources to be fixed in supply, tastes constant, technical knowledge given, and imports equal to exports with no international capital movements. Such restrictive conditions preclude an analysis of the long-run evolution of international trade and ignore the very essence of the development process. If we are to analyze relationships between international trade and development, we must consider the effects of continual increases in productive factors, the evolution of demand conditions, as well as technical progress.¹

Finally we will see whether or not the pure theory does in fact apply to underdeveloped countries or whether it is primarily concerned with the rich advanced countries as suggested by G. Myrdal,² R. Nurkse³ and G. Meier.⁴ J. Viner⁵ is of the opinion that there is still room for a great deal of international specialization and that the principle of comparative advantage should guide the poorer countries in their development programs.

G. Meier observes, "I have found that the traditional theory of international trade, when suitably extended, provides the most useful analytical framework for bringing unity to a variety of observations on the trade problems of

¹Ibid., p. 5.

²G. Myrdal, Rich Lands and Poor (New York: Macmillan Co., 1957).

³R. Nurkse, "The Conflict between 'Balanced Growth' and International Specialization", in Lectures in Economic Development, pp. 165-182, reprinted in Economic Essays, (London: The Macmillan Co. Ltd., 1957), p. 241-259.

⁴G. Meier, op. cit., p. 1.

⁵J. Viner, "Stability and Progress: The Poorer Countries Problem", in D. Hague, ed., Stability and Progress in the World Economy (London: Macmillan, 1958), pp. 41-65.

poor countries".¹

Developing an adequate theory is, however, only the initial step in formulating economic policy. In order to reach practical conclusions, one must also consider the environment with which the policy maker is concerned. It is not possible here to discuss the historical, political and strategic aspects of foreign economic policy, or for that matter, all of the economic problems involved. Nevertheless, by dealing with at least some of the purely economic aspects of foreign trade policy on an abstract theoretical level we confront an important element of policy problems.

Every statement that this or that trade policy is "desirable" or "correct" implies a value judgement. The usual "economic" value or object is maximization of the national income, but shifts in the functional, personal, regional, and temporal distribution of income are also factors that must be taken into account. One might formulate the "economic" value judgement which more or less consciously is presupposed in policy recommendations as follows: "Any policy measure or economic change is deemed good or desirable if it leads to an increase in real national income provided it does not involve a change in the distribution of income that is regarded as undesirable".²

¹G. Meier, op. cit., p. xi.

²G. Haberler, A Survey of International Trade Theory, (Special Papers in International Economics No. 1.) (Princeton University Press, International Finance Section, Department of Economics, 1955), p. 49.

3. The Plan of the Thesis

It will partly be the task of chapter one to furnish a definition of an underdeveloped country as well as to state and examine some of the structural differences between developed and underdeveloped countries. In accordance with now accepted nomenclature, 'underdeveloped', 'poor', and 'backward' will be used synonymously.

J. Viner defines an underdeveloped country as one which has "good potential prospects for using more capital or more labour or more available natural resources, or all of these, to support its present population on a higher level of living or if its per capita income level is already fairly high, to support a larger population on a not lower level of living".¹

This definition puts the primary emphasis on per capita levels of income or living. It should be noted, that it is difficult to define such terms as developed and underdeveloped rigorously as well as to categorize all the countries accordingly.

What developed countries have in common is that they are generally richer rather than poorer, but they differ among themselves in many ways, and thus it is not easy to frame general propositions which apply to them all. Similarly, in the case of underdeveloped countries, one cannot tailor a

¹J. Viner, International Trade and Economic Development (Oxford: Clarendon Press, 1953), p. 125.

description to fit closely all of the countries at once. The generalizations therefore seem to apply to most, or to many, but not necessarily to all the poorer countries.

Generally speaking underdeveloped countries are poorly endowed, per capita, with capital, with natural resources, with managerial talent and with vigour and health in their labour force. Even abundant capital and natural resources may not suffice to yield a per capita real income above the poverty level. Because of an unfavourable age structure, the ratio of the labour force to total population may be low. The labour force may not have the skills or the attitudes requisite for high productivity, and a rigid cultural pattern may be a formidable obstacle to their attainment. Managerial ability may be deficient. In any case, since capital is a consequence as well as a cause of prosperity, abundance of capital will not be found in low-income underdeveloped countries.

The underdeveloped region, then, is generally characterized by the following:¹

- 1) low level of per capita income.
- 2) a relatively less productive labour force chiefly employed in primary industries or agriculture.
- 3) evidence of considerable 'disguised unemployment' and a lack of employment opportunities outside

¹These are largely drawn from H. Leibenstein, Economic Backwardness and Economic Growth (New York: John Wiley & Sons, Inc., 1957), p. 40.

agriculture.

- 4) little diversification of production.
- 5) dominant roles of foreign capital in primary industries.
- 6) the export products, chiefly agricultural products and industrial raw materials, have low supply elasticities as well as low price and income elasticities of foreign demand, that is they face an inelastic demand.

While on the other hand, the developed region is characterized by features which are the opposites of those listed above.

- 1) per capita real income is relatively high and steadily increasing.
- 2) labour productivity is relatively high and the inhabitants are largely employed in secondary and tertiary industries.¹
- 3) the majority of the population is urbanized. Better developed practices of information exchange will facilitate greater mobility of factors of production as well as of commodities within a country.
- 4) the lines of production are highly diversified. A higher degree of diversification implies a lower probability of bottlenecks of production.
- 5) the significant parts of the economic organs are not

¹C. Clark, Conditions of Economic Progress (London: The Macmillan Co., 1957), Chapter 9.

under the control of foreigners whose interests do not always conform with those of the principal inhabitants and

- 6) exports mainly consist of manufactured commodities the supply elasticities of which are relatively high.¹

Chapter two is primarily concerned with the pure theory of international trade and the necessary assumptions upon which it rests. This analysis, which has been most thoroughly refined in terms of static general equilibrium, "with its emphasis on the relations between production and trade and its formulation of the doctrine of comparative costs"², serves as a convenient starting point for our discussion. First, however, a few general background comments on historical thought on this subject might be in order.

"Right from the classical times", writes P. Mathur, "international trade has been viewed as an instrument to increase the national income".³ The classical economists, particularly Ricardo and J.S. Mill, concentrated their efforts mainly on ascertaining these gains from trade. An effort to determine the causes of differing comparative advantages of different countries, which bring about these gains, led to

¹Some cases do not fall under this explanation. Chiefly, Canada, New Zealand, and Denmark.

²G. Meier, op. cit., p. 9.

³P. Mathur, "Gains in Economic Growth from International Trade -- A Theoretical Explanation of Leontief's Paradox" Kyklos, Vol. XVI, (May, 1963), p. 609.

the Heckscher-Ohlin theory, that under certain general assumptions, countries tend to export commodities which require for their production those factors with which the country is relatively plentifully endowed. It is interesting to note that despite considerable extension and remodelling by Marshall, Edgeworth, Taussig, Leontief and Haberler,¹ the doctrine continues to rest substantially on the classical foundations of Ricardo. The theory as presented by Ricardo is much over-simplified. Most of the later literature on the subject was concerned with stating explicitly and then dropping these simplifying assumptions to make the theory more realistic. But the presumption in favour of specialization and trade persists all through this literature. There remains the problem of how, when, and where the policies of specialization and trade should be applied.

The modern version of Ricardo's doctrine, in terms of the transformation curve or the concept of opportunity costs was a contribution of Professor Haberler.² At one time it was argued that Haberler's theory was a replacement for Ricardo's. But on closer examination it would appear that instead of demolishing the Ricardian structure, Haberler simply repaired a leaky roof; he discarded the obsolete labour theory of value.

¹J. Mill, Essays on Some Unsettled Questions of Political Economy (London: School of Economics), reprint, 1948, p. 1-21.

²L. Metzler, "The Theory of International Trade", A Survey of Contemporary Economics, ed. by H.S. Ellis, Vol. 1, (Unwin and Co. Ltd., 1957).

The Heckscher-Ohlin version of the theory of comparative cost¹ has been widely recommended as a basis for development because it does not depend on the existence of perfect competition in both domestic markets.² It explains that production of commodities that use more of a country's relatively abundant factors of production will make trade gainful. A country can export these commodities and import commodities which would have used its relatively scarce factors.

One difficulty with this theory is that it assumes the methods of production to be the same in all countries.

J. Haring maintains that the greatest weakness of both the classical and the Heckscher-Ohlin theory is "their inability to explain how production efficiency and economic structure change over time".³

To get back to our main stream of thought, the modified version of the classical theory of international trade in terms of production opportunity costs shades into a theory of mutual interdependence and offers a persuasive explanation of general static equilibrium in international trade.

¹"Comparative advantage" and "comparative costs" are used interchangeably in this thesis.

²B. Ohlin, Interregional and International Trade, "Harvard Economic Studies", Vol. XXXIX, (Cambridge, Mass.: Harvard University Press, 1933). The original article was by Heckscher, E., in Ekonomisk Tidskrift, Vol. 21, pp. 497-512.

³J. Haring, "Trade Theory and Growth in Poor Countries", Kyklos, Vol. XVI, (May, 1963), p. 374.

To recall the leading principles of this analysis we may concentrate on the usual two-country, two-commodity, two-factor model. This is the simplest possible model which contains the fundamental elements of the general equilibrium problem, but the inferences drawn from it will, for the most part, be essentially the same as those of a multi-country, multi-commodity, multi-factor model.¹ The time element is excluded as well as any process of change. Within the framework of a set of postulates, the pure theory of trade establishes the optimum conditions for production, nature of specialization, patterns of foreign trade, allocation of resources, and finally, economic welfare in a given situation, measured in terms of a higher plateau of consumer satisfaction.

It should be noted that the theory's logical consistency is above challenge. The objection, therefore, must be aimed at a different target.

Is this a sufficiently meaningful theory for development problems? Are the dictates of international trade theory incompatible with the requirements for accelerated development?

Nurkse maintains that economic growth in underdeveloped areas is not likely to be based on international specialization, with the underdeveloped countries exporting raw materials to the developed nations, and importing manu-

¹S. Mookerjee, Factor Endowments and International Trade, (New Delhi: Asia Publishing Co., 1958) p. 11.

factured goods from them.¹

In poor countries the small size of the domestic market and of the productive units in addition to the lack of social overhead capital tend to render unprofitable manufacturing and commercial activities that would be very lucrative in rich countries, according to Myrdal. Nevertheless some poor countries have tried it and succeeded.

Puerto Rico, for instance, has frequently been cited as a case where classical trade theory works to the advantage of a poor country.²

The viewpoint presented by Viner is that the principle of comparative advantage should "guide poor countries in their development programs".³ Meier would agree, especially if the theory is suitably extended.

It has been suggested that if we are to resolve these differences we must go beneath the surface in order to examine the assumptions upon which trade theory rests vis-a-vis the structural differences of developed and underdeveloped countries. This will be the primary task of chapter three, as well as to draw certain general conclusions resulting from this study.

¹Grampp & Weiler, Economic Policy (Illinois: Richard D. Irwin, Inc., 1961), p. 335.

²H. Chenery, "Comparative Advantage and Development Policy", American Economic Review, Papers and Proceedings, Vol. LI (March 1961), p. 44-45.

³Grampp & Weiler, op. cit., p. 335.

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At the theoretical level it is frequently contended that the conclusions from the static equilibrium analysis of trade theory "are irrelevant for interpreting the problems of development which are inherently dynamic".¹

It would amount to an over-simplification to state that the pure theory of trade is inadequate because it is static. Indeed, the theory does not exclude change, but the type of change it deals with is of the once-for-all variety. Chapter four will thus present a "workable" extension or modification of the pure theory of trade in order to provide a more useful analytical framework for development problems.

In adapting traditional trade theory to deal with phenomena of change, this chapter will use the method of comparative statics. Although this section will refer as much as possible to the underlying dynamics of international development problems, it will do so in a manner which is short of a truly dynamic analysis of the time path of the process of change.

The theory of international trade to a higher degree than "any other part of economic speculation has kept faithful to the heritage of the classical economists",² resulting in a strange isolation of the theory of trade from the facts of economic life.³ International trade theory was "never

¹G. Meier, op. cit., p. 152.

²G. Myrdal, op. cit., p. 151.

³Ibid., p. 151.

developed to comprehend the dynamic process of underdevelopment and development,"¹ and thus on the whole the literature is curiously devoid of attempts to relate the two.

Chapter five has been given the task of being briefly concerned with policy considerations as well as furnishing the concluding remarks for this thesis. Comparative advantage will be discussed as a principle of planning with respect to resource allocation.

¹Ibid., p. 151.

CHAPTER II

THE COMPARATIVE ADVANTAGE MODEL

1. Introduction

This chapter consists primarily of two sections. In the first, all the assumptions underlying the model will be discussed, while in the second, the model itself will be developed. The chapter will conclude with a brief word on the extension of the analysis beyond the confines of the two-country, two-good, two-factor model.

The quest of economics for a satisfactory explanation of the differing costs of producing identical goods in different countries has produced three leading theories: the classical doctrine of comparative costs, first formulated by Ricardo and later elaborated and refined by Mill, Marshall, Tausig, and others; Prof. Haberler's opportunity cost theory; and finally the general equilibrium theory of the Swedish economist, Bertil Ohlin. The latter two theories are the outgrowth of the modern theory of value. The doctrine of comparative advantage was originally based entirely on labour costs but was later refined or reformulated into a multiple-factor theory by Haberler. Haberler's opportunity cost theory and Ohlin's mutual interdependence theory are built directly on money costs.

Surprisingly little critical attention has been paid to what we know as the Ohlin-Heckscher theory of trade.¹ The basic Ohlin-Heckscher theorem that trade depends upon relative factor-endowment has merely been accepted as a conclusion without further investigation and relatively little has been written to challenge it.² The articles relating to their theory of trade have been mainly the controversy over the effect of trade in commodities on factor prices.

Before going on to formulate the Ohlin model, we should stop and consider one important aspect of trade theory, namely; What is the cause of trade, as distinct from the basis of trade?

Ohlin would answer this question as follows: trade exists because of inequalities in the relative commodity price ratios in any two countries before trade was opened up.³ Each country exports those products that it could produce relatively cheaply (vis-a-vis another country) and imports those that it could produce relatively expensively. So the problem was to discover what brought about any differences in the commodity price ratio as between the prospective

¹J.L. Ford, "The Ohlin-Heckscher Theory of the Basis of Commodity Trade", Economic Journal, Vol. LXXIII (September 1963), p. 458.

²The main piece of work on it was by R. Robinson, "Factor Proportions and Comparative Advantage", Part I & II, Quarterly Journal of Economics, Vol. LXX (May, 1956), pp. 169-192 and (August, 1956), pp. 346-363.

³B. Ohlin, op. cit., p. 14.

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trading countries. Ohlin set out to accomplish this.

Ohlin's conclusion is contained in his basic model, which in turn is developed from a framework consisting of a number of implicit, and explicit, assumptions. Heckscher and Ohlin were prepared to make these assumptions presumably in the belief that they were sufficiently realistic to yield empirically significant theorems. The assumptions of the basic model dominate Ohlin's thoughts and ideas on trade behavior patterns. The basic model then envelops what to Ohlin were the essential economic facts for an analysis of what the basis of trade really is. The all important assumptions in more detail are as follows:

2. The Assumptions of the Model

1) The recent version of the Heckscher-Ohlin theory mentioned above is generally presented in terms of a "two-factor, two-commodity, two-country model where both commodities are produced by each country and both factors are used to produce each commodity".¹ The two countries are designated A and B, the commodities X and Y, and the factors of production being labour (L) and capital (C).² Each of the factors is homogeneous, but the countries are differently endowed with the factors. This very simple model is adopted because it is easily amenable to geometric treatment.³ The

¹S. Mookerjee, op. cit., p. 11.

²It should be noted that Ohlin introduces many factors and many commodities from the beginning.

³S. Mookerjee, ibid., p. 11.

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inferences drawn from the model will in essence be the same as those from a multi-country, multi-commodity, multi-factor model.¹ That is, introduction of more commodities, factors and countries would not destroy the validity of the basic theorem.²

2) There is free and perfect competition in all markets, i.e., the "factors" and "goods" markets.³

3) There exists international immobility of productive factors, but all the factors are completely mobile within each country.⁴

4) When trade is opened up between two countries there will be no transportation costs nor trade barriers.⁵

5) The properties of the technological production functions are the same in the two countries and do not change.⁶ As an extension of the above statement, the goods or products are or can be classified according to their factor-intensity.⁷ Thus we can say that one of the goods is capital-intensive while the other is labour-intensive. This implies that when

¹Ibid., p. 59.

²B. Ohlin, op. cit., p. 22.

³Ibid., p. 18.

⁴Ibid., p. 9-10.

⁵E. Heckscher, "The Effect of Foreign Trade on the Distribution of Income", pp. 272-300, Readings in the Theory of International Trade, Edited by H.S. Ellis for A.E.A. (Philadelphia: Blakiston, 1949), p. 274.

⁶B. Ohlin, op. cit., p. 14.

⁷Ibid., p. 19.

we postulate that one of the products is capital-intensive in one country it must be capital-intensive in the other. Furthermore, it is implicitly assumed that in most cases when we have stated that one product is, say, capital-intensive it must remain so for all relative factor prices.¹

We define a country to be relatively well endowed with capital if it has more units of capital per unit of labour than does the other country. If we say that A is relatively well endowed with capital we may also say that in A capital is cheap relative to labour relative to B, ignoring special demand conditions which could yield exceptions.

6) The state of technology is given, and the production function is mathematically differentiable. Another simplifying characteristic of this production function is that it is subject to constant returns to scale. In terms of mathematics, this assumption presupposes that either of the two products X and Y may be produced from capital (C) and labour (L) according to a production function that may be written as

$$X = L \cdot X \left(\frac{C}{L} \right)$$

i.e., the production functions are homogeneous of the first order. A single equal product line (isoquant), for any given level of output, defines the entire technology.

It may be useful to digress a little and find the economic significance of this assumption. A technology of

¹Ibid., p. 67.

an industry operating under such conditions will have such a production function, even if identical technologies of individual firms are subject to decreasing costs up to a point and increasing costs thereafter. This is also the case in the short run, for a limited range of output. In the long run, each firm in the industry will operate at its minimum average cost, equal for each producer, and any expansion or contraction of output will be realized solely through an increase or decrease in the number of firms. The average and marginal costs, measured in terms of the output taken as a numeraire, will not change.

7) The possibility of perfect specialization of one commodity by one of the countries is totally excluded. The exclusion is for brevity's sake, to avoid special situations that arise when each country does not produce both products.

8) All resources are fully employed.

9) The patterns of consumers' tastes and preferences are given and identical in both countries.

10) The production function is in conformity with the law of diminishing marginal productivity. In terms of the isoquant map, each isoquant will be convex to the origin. It should be noted that the procedure of the pure theory of trade relies essentially upon the marginal productivity theory.

From the assumptions listed above it is possible to ascertain what the basis of trade is. We suppose that A is relatively well-endowed with capital: B, therefore is

relatively well endowed with labour. X is relatively capital-intensive leaving Y as the relatively labour-intensive commodity. We must then compare the pre-trade situations with each other, and discover, in the pre-trade situation, if the commodity price ratio in A differs from that in B.

Because in A capital is relatively cheap, and in B labour is relatively cheap, it must follow that, on the assumptions of the model, A can produce X relatively more cheaply than it can produce Y. B must also be able to produce Y relatively more cheaply than it can produce X.

It follows then that we must have trade between A and B. The former will export X; the latter will export Y. What is the basis of the observed difference in relative commodity prices? The answer must be the relative differences in the relative different endowments of A and B with the productive agents, capital (C) and labour (L).

This is what has become known as the Heckscher-Ohlin theory: a country exports those commodities produced with relatively large quantities of the country's relatively abundant factor. Ohlin concludes, "in a loose sense we may say that the differences in equipment of factors of production are the cause of trade".¹

We can say, then, that if we have two countries who have different factor endowment ratios, on the Heckscher-Ohlin assumptions, the relatively capital abundant country

¹B. Ohlin, op. cit., p. 17.

must export the relatively capital-intensive produce, while the relatively labour-abundant country must export the relatively labour-intensive commodity.¹

Having listed the assumptions of the model, and briefly indicated how they provide a theoretical basis for trade, we will now use the diagrammatical tools of international trade theory to establish the theoretical conclusions more fully and rigourously.

This is an instantaneous model which abstracts from the time element and from any process of change.

3. The Heckscher-Ohlin Model: A Geometric Treatment

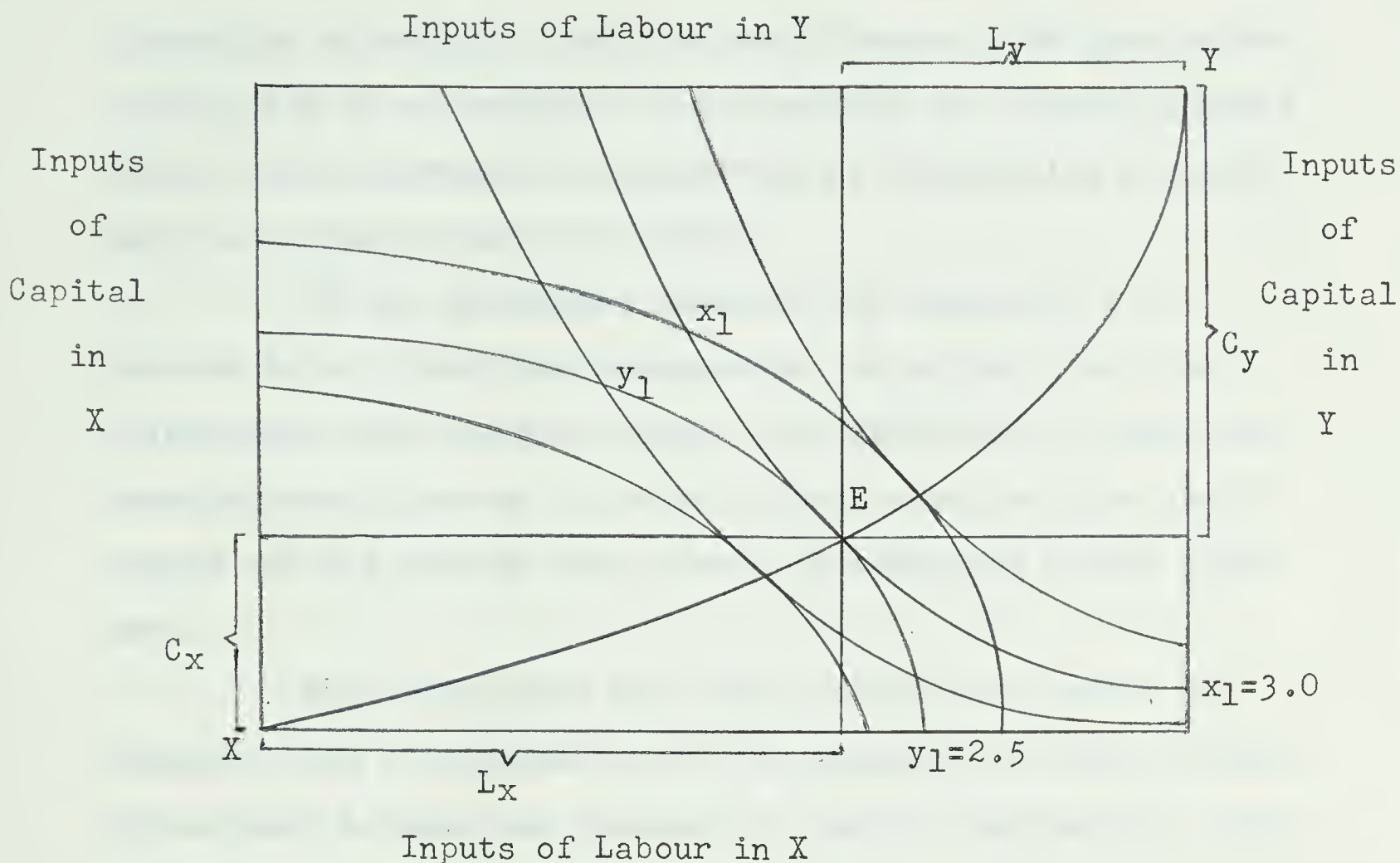
The present section attempts to express the character and fundamental properties of the model in reasonably simple geometric terms, using the Edgeworth box diagram as a basis.

The Edgeworth box is a device for illustrating the allocation of two resources, each fixed in total amount, between two types of uses. It can be used to show the interrelationships between no less than twelve economic variables in terms of a plane diagram, provided that the relationships are of a certain kind. Diagram 1 shows the particular version of the box diagram that will be used in the Heckscher-Ohlin model.

The commodities produced are X and Y. Let us consider, say, country A and construct a rectangle whose two

¹J. Ford, op. cit., p. 465.

Diagram 1



dimensions correspond to the factor endowments of country A, that is, the sides of the box measure total factor supplies: on any of the vertical sides is indicated total supply of capital and on any of the horizontal sides total supply of labour. Any point in the box represents four things: measuring from the lower left-hand corner (the X-corner) the amounts of labour and capital used to produce commodity X and measuring from the upper right-hand corner (the Y-corner) the amounts of labour and capital used in the production of commodity Y.

The curve x_1 is an isoquant, one out of a one-parameter family of such curves, which indicates the various com-

binations of factor inputs which all just enable the output of a quantity x_1 of commodity X to be produced. The more distant an x-isoquant lies from the X corner, the greater the output of X it represents. The isoquants are concave outward because they represent an assumption of diminishing marginal physical productivity of factors.

If the production function for commodity X is assumed to be linear and homogeneous, as we have, all the x-isoquants have the same shape, only differing in scale and becoming more blown-up the more distant they are from the X corner and the greater the outputs of commodity X they represent.

Each x-isoquant has one, and only one, point of tangency with a y-isoquant and E in Diagram 1 is such a point of tangency between the isoquant x_1 and the isoquant y_1 . The isoquant y_1 represents the various input combinations of factors which just enable quantity y_1 of commodity Y to be produced. There is a one-parameter family of y-isoquants related to the Y-corner just as the x-isoquants are related to the X corner. Since we also assume the production function for commodity Y to be linear and homogeneous, all the y-isoquants have the same shape, only differing in scale and becoming more blown up the more distant they are from the Y-corner and the greater the outputs of Y they represent.

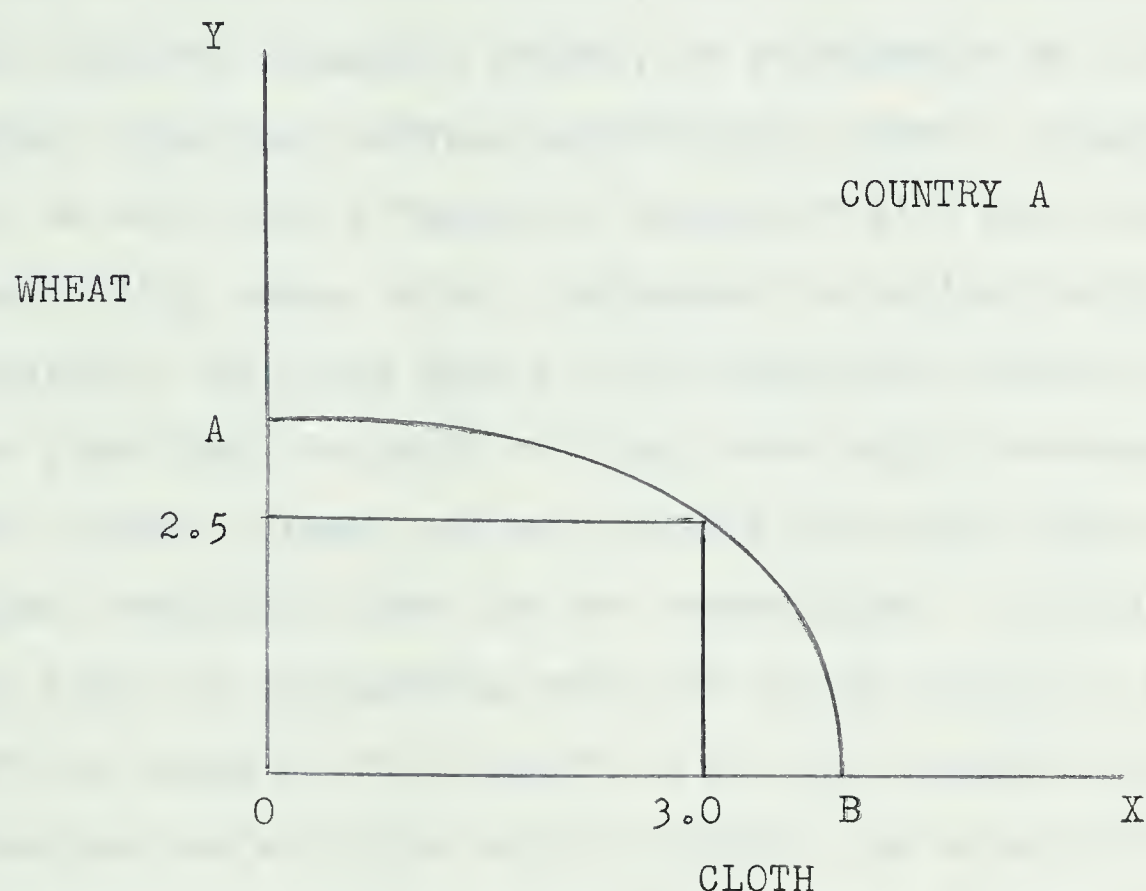
The point of tangency between two isoquants represents an optimal allocation of factor inputs in the sense that if a preassigned amount of one commodity is to be pro-

duced, the choice of the particular input combination represented by the point of tangency enables a maximum amount of the other commodity to be produced. Thus, the factor inputs represented by point E enable both x_1 and y_1 to be produced. Other input combinations in commodity X, represented by other points on the x_1 -isoquant, also enable quantity x_1 of X to be produced, but the remaining amounts of labour and capital do not enable as much of commodity Y to be produced as y_1 . It might be recalled that $L_x + L_y = L$, where L stands for total supply of labour, and $C_x + C_y = C$, where C stands for total supply of capital. The locus of all efficiency points such as E will generally run from the origin X to Y. We have drawn such a locus, usually referred to as a contract curve or efficiency locus, XEY in the diagram. This contract curve indicates the whole range of optimal input allocations. Points which are inside the box but not on the contract curve represent possible factor input combinations, but they are non-optimal. The curve will be convex downward or upward, depending on whether commodity X is labour-intensive relative to commodity Y or not, in the relevant region where production takes place. On the limit, if both technologies were exactly the same, the contract curve would be a straight-line diagonal connecting X and Y.

It is very easy now to read from any point such as E the levels of output (such as 3 and 2.5) of the two commodities. Plotting such observations in an X-Y plane, we obtain the production possibility curve of country A, AB.

This is shown in Diagram 2. It follows that to every point on the production possibility curve representing an output combination corresponds a point on the contract curve representing an input combination.

Diagram 2



Such a locus, also referred to as the opportunity cost curve or transformation function, is concave toward the origin for country A, as shown in Diagram 2, because the production functions of both industries in country A are in conformity with the law of diminishing marginal productivities. It should be noted clearly that the convexity, straight line, and concavity of transformation curves are related to increasing, constant, and decreasing marginal productivities of factors of production; and also that the unit homogeneous production function does not necessarily result in a straight

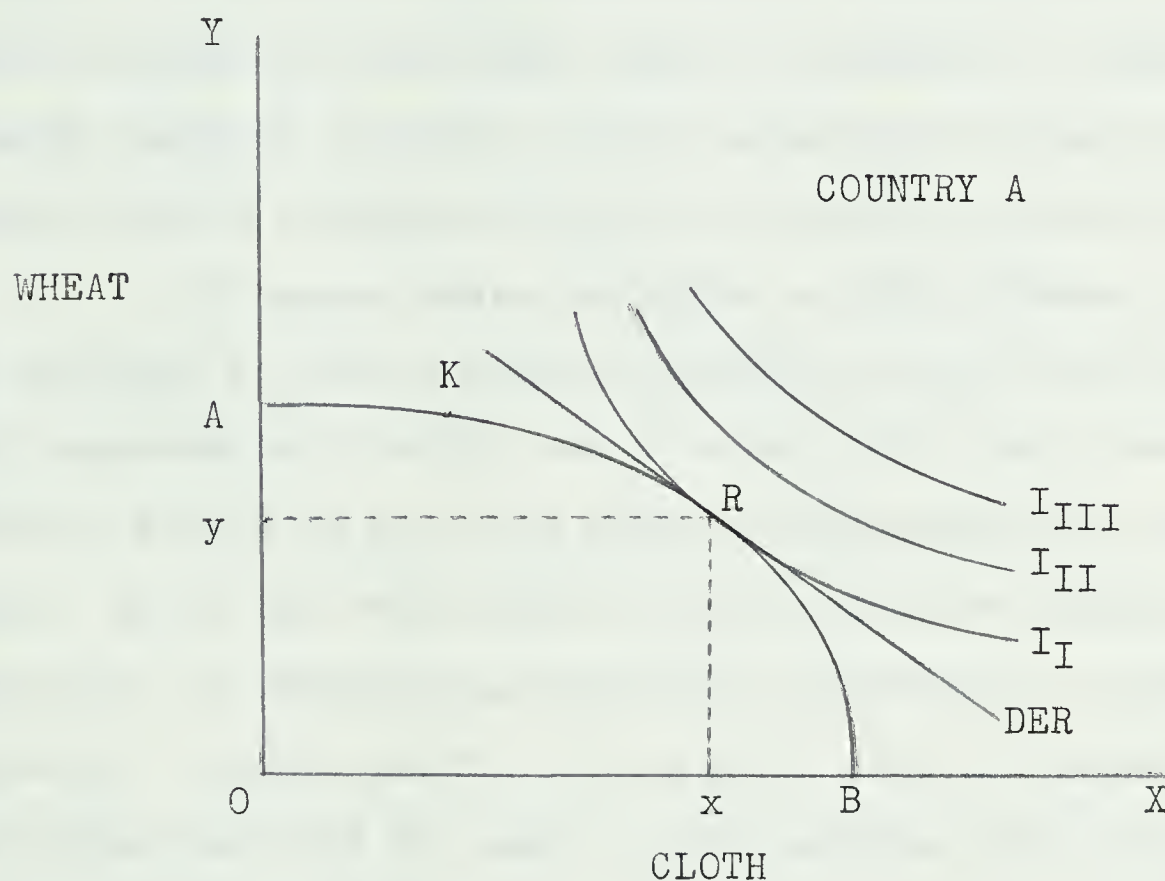
line product transformation curve. Only in the case of identical technologies, with unit homogenous production functions, would the production possibility curve be a straight line.

Given the shape of the production possibility curve and given the demand conditions (for example represented by a set of parallel price lines, the slope of which indicates the relative commodity prices, or represented by a set of market behaviour curves or indifference curves Diagram 3 and 4), we will find a "point of tangency" with the production possibility curve, which indicates the optimal output combination. By going back to the underlying contract curve we can then find the point on that curve which corresponds to the output optimum, and we can thus determine the optimal input combination for the two commodities. In addition we can find the equilibrium ratio of factor prices by reading off the slope of the tangent to the two isoquants at their intersection with the contract curve: the steeper the tangent, the higher the price of labour relative to capital.

Under increasing costs, the production possibilities curve is not identical with a price curve, as in the case of constant costs. The price at which Y (wheat) will exchange for X (cloth) cannot be determined by the production possibility curve by itself, but can be found only with the assistance of data on demand. The complex of problems presented by demand will not be discussed in this chapter. It may be noted that price is indicated by a straight line between the Y and X axes, labelled DER in Diagram 3, the slope of which

represents the ratio at which wheat will exchange for cloth, and that production, under a transformation curve representing increasing costs, will take place at the point on the curve tangent to the price in the market.

Diagram 3



In Diagram 3, DER is the domestic price ratio, and I_I , I_{II} etc. represents the community indifference map. The community indifference map of Country A will enable us to determine how much of X (cloth) and Y (wheat) should be produced in a closed economy. The tangency, R, of a community indifference curve with the product transformation curve expresses the maximization of social welfare. Diagram 3 shows that Country A maximizes welfare by producing and consuming x units of cloth and y units of wheat.

In Diagram 3, production will take place at R, on the production possibility curve, AB, whenever the price is DER. At R, production will consist of O-y units of wheat and O-x units of cloth. If the economy produced cloth and wheat at point K on the AB curve, the price DER could not be sustained. At this price there would be too much wheat in relation to cloth or too little cloth in relation to wheat. The unsold quantity of wheat and the unsatisfied demand for cloth would require a change in price to maintain production at K.

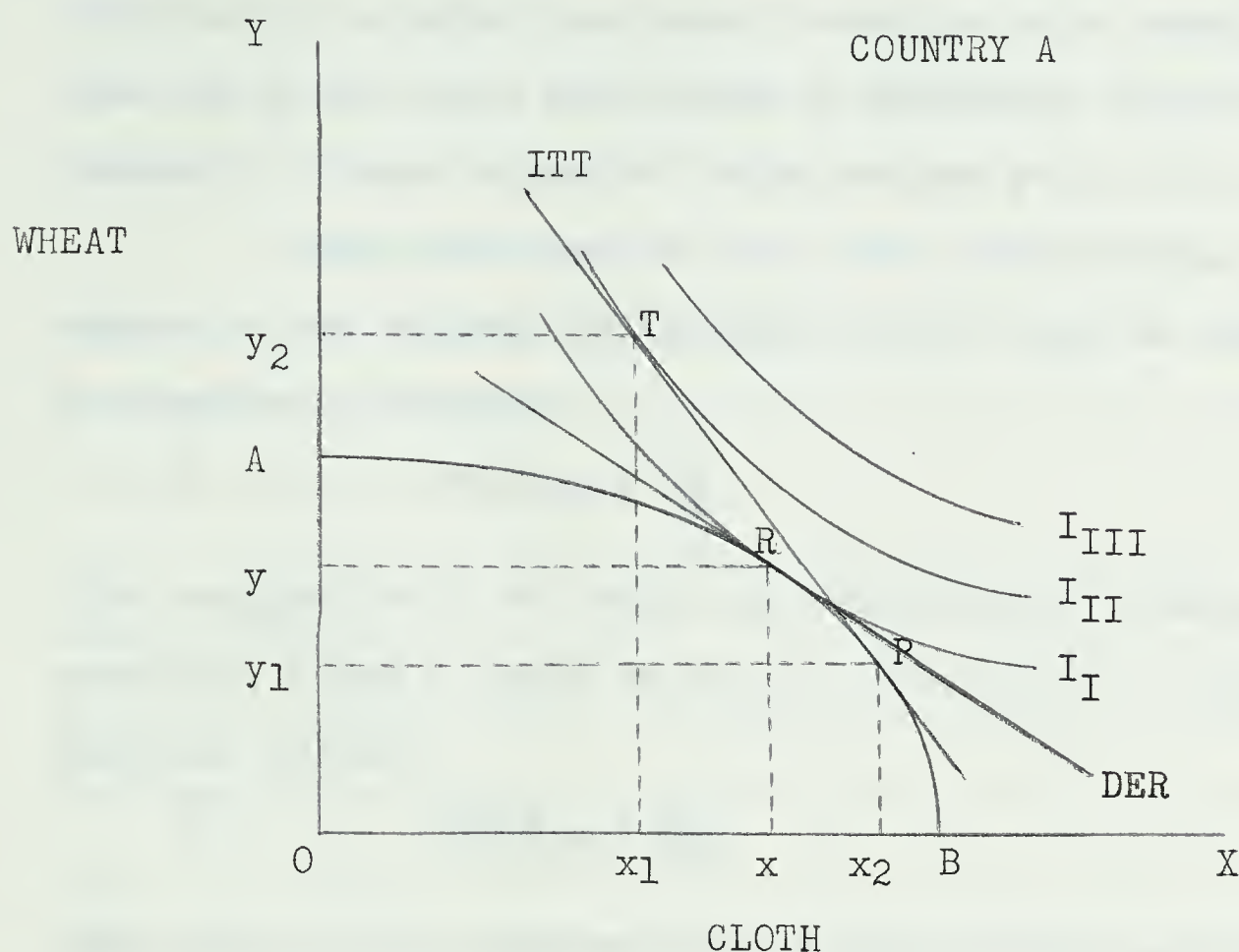
If demand keeps the price at DER, however, it will be possible to earn a higher return in cloth than in wheat, and resources will shift out of wheat into cloth, moving production from K to R. This shift of resources will continue until, given the price DER and the production possibility curve AB, an optimum allocation of resources is reached at point R. At this point, the marginal rate of transformation in production will be equal to the marginal rate of transformation through trade.

If we now introduce the possibility of international trade the above diagram is changed slightly as shown in Diagram 4.

Country A is now able to exchange commodities at a price ratio which is different from its own closed economy price ratio.

In Diagram 4, the production opportunity curve AB, the community indifference map I_I , I_{II} , I_{III} , etc., the domestic price ratio DER and the international terms of trade

Diagram 4



line ITT, depict the situation of an open economy, its trade induced production mix, the nature of its specialization, the pattern of its foreign trade and the tangible benefits therefrom measured in terms of a higher plateau of consumer satisfaction (indifference curve I_{III}). Since the terms of trade line ITT, has become steeper than the internal price line DER, a unit of X will exchange for more units of Y on the world market than on the home market and hence country A will specialize in the production of X in which it has a comparative advantage. Country A's exports to and imports from Country B are represented quantitatively by $x_2 - x_1$ and $y_2 - y_1$ respectively.

Gains from trade accruing to Country A are expressed by a higher community indifference curve I_{III} . The condition required for a gain from trade to accrue to a country is simply that the price ratio with trade be different than without trade. Country A is now better off with the new price ratio ITT .

The conditions of free trade equilibrium, which appear in the diagram as tangency points, may be expressed in symbols as follows:

$$I \dots \dots MRTS_{xy} = \frac{P_y}{P_x}$$

(the marginal rate of technical substitution between the two products, X and Y, must be equal to the ratio of their international prices).

$$II \dots \dots MRCS_{xy} = \frac{P_y}{P_x}$$

(the ratio of the international prices of the two products, X and Y, must be equal to the marginal rate of consumer substitution of X for Y)

$$III \dots \dots E = M$$

(the value of total exports must be equal to the value of total imports).

In addition to these three necessary conditions of international equilibrium, the sufficient or stability conditions of equilibrium require that at the points of tangency, the slope of the production possibility curve must be increasing at P and that of the community indifference curve must be diminishing at T. In other words, the maximum solution depends on the concavity of the transformation curve and the convexity

of the indifference curve, reflecting the principle of increasing marginal rate of technical substitution and the principle of diminishing marginal rate of consumer substitution (consistent with the Marshallian principle of diminishing marginal utility) as mentioned previously.

Under these conditions then, the pure theory of international trade offers a uniquely determined solution to problems of trade, specialization and economic welfare in a given situation.

Thus far the argument has progressed upon the assumption of constant unit costs, i.e., the assumption that industries may indefinitely increase their output with an unvarying cost per unit. While some economists believe that many industries may expand their outputs over a wide range at constant costs, it is true that many other industries can increase their output only at an increasing cost per unit. This is generally true in agriculture in which a larger output necessitates cultivating poorer land or cultivating more intensively land already under cultivation. In either case, the result is that additional units of production can be forthcoming only at a greater unit cost as production enters the stage of diminishing returns.

Increasing costs are easily incorporated into the theory of comparative advantage. Where production is subject to increasing costs, trade will still be profitable, and each country will export the product of its comparative advantage. But if production enters the stage of diminishing returns, the

volume of gainful trade will be smaller than if constant costs had prevailed. International specialization will not go so far as under constant costs.

Thus, increasing costs call for no essential modification of the comparative advantage theory.

In conclusion, some remarks on the extension of the analysis beyond the confines of the two-country, two-goods, two-factors model seem called for.¹ In the first place, recognition of the third factor land, used predominantly in agriculture, introduces the classical problem of diminishing returns.

Second, where the theory is deficient is in its not having been extended to a multi-country, multi-commodity framework. The Heckscher-Ohlin conclusions hold when there are many commodities and two countries, since additional goods can be represented by additional curves showing the relation between the optimal capital: labour ratios used in their production and the relative factor price.² However, when there are many countries and commodities it is not clear, in the absence of theoretical analysis, what conditions will suffice to make the Heckscher-Ohlin hypothesis true -- in any of the several alternative versions that are possible in a multi-

¹For a more detailed discussion see; Mookerjee, op. cit., p. 59.

J. Bhagwati, "The Pure Theory of International Trade: A Survey". The Economic Journal, Vol. LXXIV (March, 1964), pp. 20-21.

²H.G. Johnson, International Trade and Economic Growth (London: George Allen and Unwin, 1958), p. 29.

country framework:¹ (1) the comparison of factor endowments may be between country A and the sum of all the other countries of the world or (2) it may be between country A and the sum of all the countries directly in trade with it; or (3) between country A and each of the countries in direct trade with it, so that the Heckscher-Ohlin hypothesis would hold for each pair of countries. There is little in the traditional analysis of the Heckscher-Ohlin hypothesis which affords a reliable clue to a meaningful choice among these different ways in which a Heckscher-Ohlin hypothesis can be interpreted in a multi-country framework.²

"While the technique of analysis can be adapted to handle more countries and more commodities, it cannot easily be extended to allow for a larger number of factors of production, since each additional factor introduces an additional factor price and endowment ratio".³

Bhagwati regards the theory as being deficient in the area of a multi-country, multi-commodity framework⁴ (especially from the viewpoint of empirical testing, since the real world constitutes a multi-country, multi-commodity international economy).

¹J. Bhagwati, op. cit., p. 20.

²Ibid., p. 20.

³H.G. Johnson, op. cit., p. 30.

⁴T. Bhagwati, op. cit., p. 20.

Thirdly and finally, recognition of intermediate products which may be traded, and of the network of intersectoral transactions, greatly complicates the simple connection assumed in the foregoing analysis between domestic demand for and supply of final products, and the volume of international trade.

As noted in Chapter One, the logical consistency of the model is difficult to challenge. Any objections to the model therefore must be against the relevance of its initial assumptions.

CHAPTER III

THE APPLICABILITY OF THE MODEL

1. Introduction

It will be the task of this chapter to ascertain whether or not our trade model in its static form, as outlined in the previous chapter, is applicable to developing countries. Not all assumptions will be considered. The final section of this chapter will deal with the conclusions reached by this study.

2. Importance of Trade

"International trade is of very considerable importance to underdeveloped countries, and the benefits which they derive from trade and any variations in their trade affect their national incomes very deeply".¹ The opposite view, which is frequent among economists, namely, that trade is less important to the underdeveloped countries than it is to industrialized countries, may be said to derive from a logical confusion between the absolute amount of foreign trade which is known to be an increasing function of national income, and the ratio of foreign trade to national income. Foreign trade tends to be proportionately most important when incomes are lowest.

¹H.W. Singer, "The Distribution of Gains Between Investing and Borrowing Countries", American Economic Review, Papers and Proceedings, XL, No. 2 (May, 1950), p. 473.

Secondly,¹ fluctuations in the volume and value of foreign trade tend to be proportionately more violent in underdeveloped countries and therefore also more important in relation to national income. Thirdly, fluctuations in foreign trade tend to be immensely more "important for underdeveloped countries in relation to that small margin of income over subsistence needs which forms the source of capital formation",² for which they often depend on export surpluses over consumption goods required from abroad. In addition the importance of foreign trade to underdeveloped countries may also have been obscured by a second factor, namely by "the great discrepancy in the productivity of labour in the underdeveloped countries as between the industries and occupations catering for export and those catering for domestic production".³ Thus the economy of the underdeveloped countries often presents the spectacle of a dualistic economic structure; a high productivity sector producing for export, coexisting with a low productivity sector producing for the domestic market. Hence employment statistics in underdeveloped countries do not adequately reflect the importance of foreign trade, since the productivity of each person employed in the export sector tends to be a multiple of that of each person employed in the domestic sector. Since, however, employment data for underdeveloped countries are no-

¹Ibid., p. 473.

²Ibid., p. 473.

³Ibid., p. 473.

toriously easier to compile than national income data, it is again easy to slip from the fact that the proportion of persons employed in export trade is often lower in underdeveloped countries than in industrialized countries, to the conclusion that foreign trade is less important to them. This conclusion is fallacious, since it implicitly assumes rough equivalence of productivity in the export and domestic sectors. This equivalence may be safely assumed in the industrialized countries but not in the underdeveloped countries.

A third factor which has contributed to the view that foreign trade is unimportant in underdeveloped countries is the indisputable fact that in many underdeveloped countries there are large self-contained groups which are outside the monetary economy altogether and are therefore not affected by any change in foreign trade. In industrialized countries, by contrast, it is true that repercussions from changes in foreign trade are more widely spread; but they are also more thinly spread.¹

3. Features of Underdeveloped areas with emphasis on the Assumptions of our model.

Many of the underdeveloped areas have large agrarian populations in which there is either persistent open unemployment or in which the marginal productivity of the working force

¹ A more statistical factor might be mentioned. Some underdeveloped countries, Iran for example, exclude important parts of their exports and imports from their foreign trade statistics insofar as the transaction of foreign companies operating in the underdeveloped country are concerned. This is a tangible recognition of the fact that these pieces of foreign investments and their doings are not an integral part of the underdeveloped economy.

is so low that it is commonly believed that withdrawal of a sizable fraction would not significantly affect output. This seems to be the case to varying degrees for much of Asia and the Middle East. It has been suggested that the unemployment difficulties of underdeveloped countries are not basically due to lack of effective demand but stem from a few characteristic conditions, such as factor market imperfections, limited technical substitutability of factors and inappropriate factor endowments,¹ with divergencies between the proportions in which goods are demanded and in which they can be supplied with full use of available factors.

Factor market imperfections which limit factor mobility create employment problems in underdeveloped areas with low per capita incomes and limited capital resources which are not different in kind but are much different in degree from those existing in the more advanced countries. The existence of market imperfections is one of the most important underlying characteristics in the economies of underdeveloped countries.² The labour market is imperfect in the sense that there is a pronounced difference between the 'accounting price of labour', and its 'market price', i.e., the existing wage rate. It follows that the market

¹R. Eckaus, "The Factor Proportions Problem in Underdeveloped Areas", American Economic Review, Vol. XLV (September, 1955), p. 540.

²R. Bhardwaj, "Factor Proportions and Full Employment", Ecònomia Internazionale, Vol. XVII (March, 1964), No. 2, p. 253.

price of labour is above the equilibrium price that would prevail in a labour market characterized by full mobility and perfect competition. The market price of labour is too high to induce employers to hire all available labour and it could be said, as Kindelberger does, "that the wage rate does not represent factor endowments".¹ Thus, the so established equilibrium involves unemployment of labour in various forms. It happens in almost all underdeveloped economies that the fixation of the minimum wage-rate, often set above the equilibrium wage rate,² and other rather too generous social policies are enforced relatively more rapidly than the pace of economic development. (The minimum wage rates are normally decided largely on the cost of living basis and not so much on the considerations as to where the equilibrium point on the labour demand curve would lie. Further, the trade unions in the organized industrial sector often succeed in pushing their demand for greater social security through and this adds to the difference between the 'accounting prices' and the 'market prices'.)

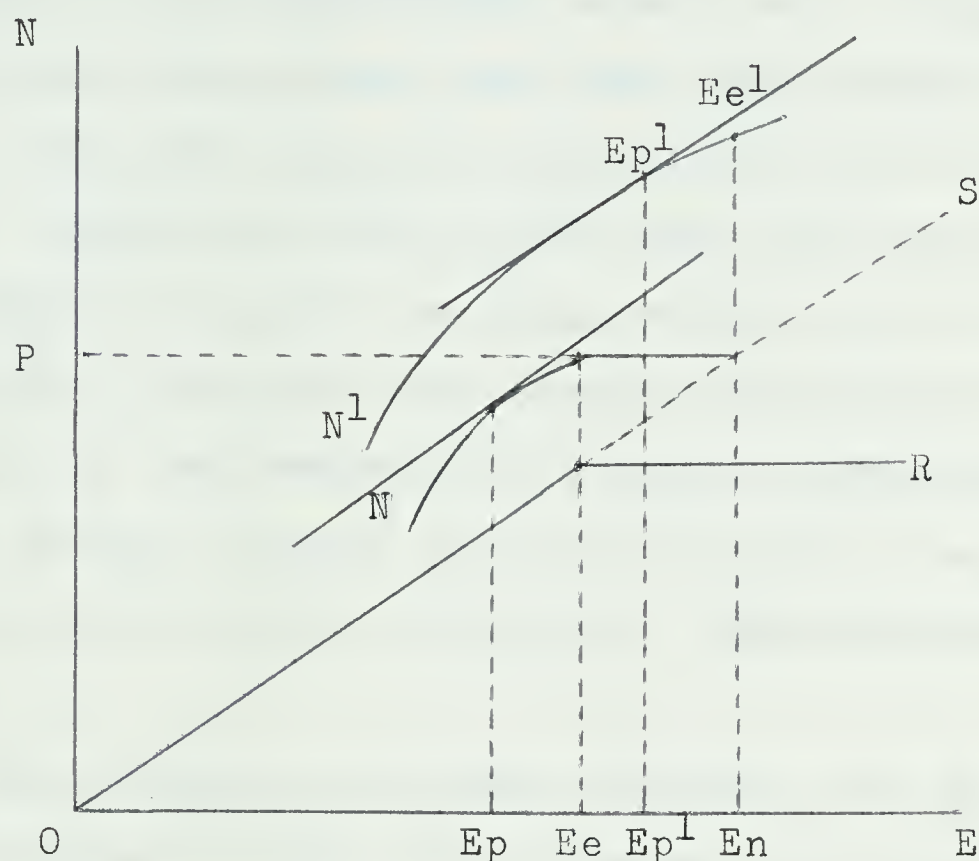
The existence of under-employment, as distinct from 'full' or complete unemployment, is another important inherent feature of an underdeveloped economy which inevitably raises

¹R.S. Eckaus, op. cit., p. 541.

²I have not shown diagrammatic representation of this verbal statement. For this see (i): W.A. Lewis, "Economic Development with unlimited Supply of Labour", Manchester School of Economic and Social Studies, Vol. XXII (May, 1954), p. 146 (ii) R.S. Eckaus, op. cit., p. 541.

some unsurmountable difficulties in assessing the volume of unemployment of labour. The problem of underemployment in backward economies may be represented graphically as follows:¹

Diagram 5



Let N be the national product, E the level of employment, then $N = f(E)$. Let us further assume that the nominally employed labour force is OE_n . The production curve N expresses the national product obtained with given productive equipment at different levels of employment. Beyond OP , no matter how much the labour force increases, total output will increase no more. The given productive resources, other than labour, have reached their maximum productivity and the national pro-

¹A. Navarrete, Jr., "Underemployment in Underdeveloped Economics", International Economic Papers, No. 3 (June, 1953), pp. 237.

duct can be increased only if new productive equipment is added and we pass to a new production curve N^1 .

The nominal employment level E_n is a situation in which there is hidden underemployment, and where the marginal productivity of the factor labour equals zero. If the slope of OS represents the average wage rate, then productive employment E_p is that where marginal productivity equals the real wage rate. Beyond the point of effective employment, E_e , a greater quantity of labour no longer yields any increment to total output, the wage curve becomes discontinuous, since there can be no real remuneration for zero productivity, and a national product of equal size will now have to be apportioned to a greater number of workers. Underemployment is $OE_n - OE_p$.

When productive equipment increases, the production curve is displaced to N^1 , hidden underemployment disappears and nominal employment E_n may coincide with effective employment E_e^1 . Productive employment will have risen to E_p^1 , on the assumption of constant average wage rates. If average wage rates increase, the argument is substantially the same, although the new level of productive employment will be somewhat lower. There still remains a residue of underemployment $OE_n - OE_p^1$, which will be absorbed in productive employment if the availability of complementary resources (fixed capital, technical knowledge) further increases.

Remembering that E_n is the nominal volume of employment, and E_p productive employment (where the marginal pro-

ductivity of labour equals the real wage rate), let E_c be full employment, defined as a situation in which there is neither underemployment nor unemployment. At E_c productive equipment and effective demand are adequate, there is a sufficiency of complementary resources, and the productivity of labour is at its maximum and optimum. The following definitions then hold:

underemployment exists when $E_n > E_p < E_c$,
 full employment exists when $E_n = E_p = E_c$,
 unemployment exists when $E_n = E_p < E_c$, and
 overfull employment exists when $E_n < E_p > E_c$.¹

If the technical substitutability of factors is limited, as is the general case in underdeveloped countries, the possibility of labour redundancy arises. Even if there are some sectors in which labour always has a positive marginal product there may be a divergence between maximum value output and full employment output if there is insufficient demand for the output of these sectors. These possibilities are again more important for the underdeveloped areas whose resource endowments are often not suited to the factor proportions dictated by the technological leadership of advanced countries. Differences in income distribution and the range of products may also make limited technical substitutability a more pressing problem in underdeveloped than in advanced

¹Overfull employment may be defined in words as existing when, at a given size and productivity of the labour force, there is full employment and a rise in the demand for investment goods. (Ohlin, The Problems of Employment Stabilization (New York, 1949)).

areas.

The assumptions of trade theory do not apparently describe the internal and external geographic mobility of productive factors in underdeveloped countries. The obstacles often cited as hindering the free movement of factors within a less advanced country are: inferior organization of capital and labour, inferior domestic banking, as well as means of communication and the perception of economic opportunity. The movement of capital, and to a lesser degree of labour, is therefore likely to be more free from a more advanced to a less advanced country than is the internal mobility of factors in the latter.

Even for the advanced countries the facts remain complex and generalizations about them fraught with some danger. As already stated, the underdeveloped world contains countries which differ widely in their internal geographic mobility. Whether for countries so diverse one can make any assumptions, applicable to all, regarding mobility of economic factors is a question not easily answered.

4. Appraisal of the Heckscher-Ohlin model: Relevance of the assumptions.

It is argued here that the Heckscher-Ohlin factor proportions account of trade considered in terms of production functions, taste patterns and the like, rests on a tenuous base. Its assumptions are too demanding to be likely to fit any real-life circumstances. In consequence, and particularly where the factor "capital" is involved, "its account of the

nature of comparative advantage and of international trade is seriously misleading."¹

It may be recalled that Ohlin was fully aware of the various forces which govern production and trade patterns of a country other than the ones explicitly considered in the simplified exposition. He realized that, even ignoring dynamic considerations, difference in quality between factors of production in different technical processes, the economies of large scale production, differences in fiscal policy and transport costs -- all these might substantially modify the conclusions derived from the abstract model.² Differing national tastes or income distribution may influence the price pattern, perhaps even to the point of reversing the trade flow indicated by factor supplies. "External economies may form a basis for trade even in circumstances of identical factor supplies".³ But in general these are considered minor qualifications; they do not neatly fit into a systematic theoretical pattern and Ohlin's discussion of them often remains somewhat ambiguous. This, in fact, is a common experience in economic research. As our assumptions approach reality more closely, theoretical formulation tends to become more imprecise and conclusions less certain.

¹R. Robinson, "Factor Proportions and Comparative Advantage", Part I, Quarterly Journal of Economics, Vol. LXX (May, 1956), p. 170.

²B. Ohlin, op. cit., p. 113.

³R. Robinson, op. cit., p. 170.

It seems clear, nevertheless, that of all the factors affecting the comparative advantage positions of countries, Ohlin considered differential factor endowments as the most important.¹ The model discussed abstracts from all differences between two countries except the difference in factor endowments and is thus designed to bring out most clearly the effect of this factor. Thus differences in production functions and qualities of factors are ruled out, as are the effects on comparative cost arising from differences in the scale of production. It is implicitly assumed that outputs of goods depend only on inputs of factors into the production processes for these goods; this excludes, among others, such general influences as arise from differences in social institutions and atmosphere. The technological possibilities of production, as defined by the production functions, are identical for both countries, but the range of these possible techniques which can actually be used efficiently (as shown by the contract line) is given for each country by its particular factor endowments. Differences in factor endowments will thus bias the production possibilities and each country will have an advantage in the production of goods intensive in its abundant factors.

If factor intensities are not unequivocal but if factor endowment ratios are such that within the operational ranges of the techniques defined by them, each commodity is

¹B. Ohlin, op. cit., p. 83.

intensive in the same factor in both countries, the same bias will also operate. If, on the other hand, factor endowment ratios lead to a reversal of factor intensities under the given technological conditions, then a country may no longer have the comparative advantage described before. It follows that a systematic bias to production resulting from differential factor endowments depends not merely on the identity of technological conditions in the two countries but also on an empirical assumption about the nature of this technology or the extent to which factor endowments in the two countries differ.¹ Further, the comparative advantage in production will determine the composition of trade if, in addition to identical demand in the two countries, more specific assumption is made regarding the nature of such demand.

It is not clear what value, if any, there is in the assumption that production functions are identical everywhere. Ohlin seemed to believe that this was self-evident.² But, as Samuelson remarks, "the laws of nature may be the same 'everywhere' but the laws of nature and the economically relevant production function relating maximum output obtainable from specified concrete inputs are two quite different things".³

¹H.G. Johnson, "Factor Endowments, International Trade and Factor Prices", Manchester School of Economics & Social Studies, Vol. XXV (September, 1957), p. 282.

²Ohlin, op. cit., p. 14 and p. 15 footnote.

³P. Samuelson, "International Trade and the Equalization of Factor Prices", Economic Journal, Vol. LVIII (June, 1948), p. 181.

By stretching the meaning of the concept of a factor of production to include in the function every circumstance which may conceivably affect production, the production function can certainly be made to appear identical in the two countries. But this will also drain the production function concept of its analytical value. Accordingly, Samuelson suggests that the production functions should be defined in terms of concrete input items which are variable, leaving factors which have a general bearing upon production outside the function.¹ Similar comments may be made on the appropriateness of the assumption of constant returns to scale. "The problem is to stop the theory from degenerating into a surface explanation, capable of explaining anything ex post and nothing ex ante".²

The assumption of consistent factor intensity does not appear explicitly in either Heckscher or Ohlin. Both writers, however, seem to take it for granted that different commodities are intensive in different factors and no doubts are expressed about the possibility of the intensities being reversed. In the two-factor case the phenomenon of goods retaining their factor intensity within the entire range of economical substitutions may have some empirical significance, but as the number of factors (and products) increases, the

¹Ibid., p. 181.

²R. Robinson, op. cit., p. 174. Samuelson makes this same point in his example. "The tropics grow tropical fruits because of the relative abundance there of tropical conditions." op. cit., p. 182.

concept of factor intensity loses its simplicity and its factual basis becomes rather slender.

Just as the factor proportions account assumes that production functions have particular shapes, so it assumes that taste functions have a particular shape. The restriction imposed on the taste side is perhaps even more demanding.¹ If it is said that two countries "have identical tastes", this must mean that the tastes of their individual citizens are in some sense identical, since the basis for the community function is the individual function. Suppose that one single indifference map indicates the taste-patterns of each and every citizen in both Countries 1 and 2. Only in the special unit-income-elastic case can it be said that the "community indifference map" of Country 2 must be the same as that of Country 1.² The moral of the foregoing is that it makes little or no sense to talk about "identical tastes" as between countries.

Of the three broad groups of factors, the heterogeneity of capital introduces the most serious analytical difficulties. As a factor of production in an economically meaningful sense, namely, an input capable of rendering a flow of services of a certain kind, capital in any given use must be embodied in a specific form. In this sense, capital exists in a wide variety of forms. Diversity in form is, of

¹R. Robinson, op. cit., p. 179.

²For a complete discussion of this see R. Robinson, op. cit., p. 186.

course, associated with diversity in function and this naturally increases the difficulty of making comparisons of capital-labour ratios between industries or between countries in the sense of the factor proportions theory. Further, the remarkable ability of capital to adapt itself to different roles and so to substitute for the services of other factors casts the empirical significance of factor intensity or of identical production functions into further doubt. If capital is conceived as an aggregate of fixed input items in specific forms, the question arises as to the meaning of the mobility of capital between different uses. In a progressive economy the commodity structure of capital can be continuously adapted to the changing circumstances of technology, demand or supply of cooperating factors. The higher the current rate of new investment, the easier can be the adaption. In the short run, in any case, the mobility of capital is greatly limited.¹ As a consequence, with the opening up of trade, capital may not be easily shifted from import-competing to export industries. It may be argued that comparative advantage theory is generally regarded as long-run theory and in the long run capital can be regarded as possessing the necessary mobility. For, given sufficient time, the structure of capital can be adjusted in any required manner.

It may be asked then whether a long-run construct of static economies can be very useful in explaining the nature

¹This is also true, to a degree, of other factors.

of actual trade at any time and whether developing countries can make use of the comparative advantage model and its conclusions.

5. Conclusion

This brings us to the final section of this chapter. We noted earlier that the theory links patterns of trade to factor proportions, but factor proportions are continually modified over time. More generally, the production and trade patterns of a country at any point in time do not derive merely from a particular constellation of factor supplies, tastes and technology. Rather, they may be viewed as reflecting the complex interactions of a whole series of such constellations having their origin at different dates and exerting their influence in varying measures.

Even assuming that unequal factor proportions at a given time establish a comparative advantage pattern in production, trade in the real world is not governed by this consideration alone. In moving from comparative advantage in this sense to relative prices, we have to consider, apart from the underlying preference pattern, a whole set of additional factors such as selling costs incurred to affect consumer choice, the structure of mark-ups which depend on the internal organization of the industries as well as on the organization of competing industries abroad, and institutional arrangements like collective bargaining, tariffs etc. In the presentation of the theory of comparative advantage, these factors are generally ignored by assuming given tastes,

pure and perfect competition, and so forth, so that a direct response can be established between relative prices and relative efficiency in production. The presence of these factors can and does, in fact, lead to significant deviations of the trade pattern from what would be expected from a comparison of efficiency and cost relations in production between countries.

"It may be that the conventional pure trade theory, a product of advanced countries", writes Nurkse, "is best applicable to the intratrade of countries already fairly well developed. In view of the quantitative weight of this trade such a bias would in fact be natural".¹ He further maintains that economic development in underdeveloped areas is not likely to be based on international specialization, with the underdeveloped countries exporting raw materials to the developed nations, and importing manufactured goods from them.²

We have seen in section three that the assumptions of the Heckscher-Ohlin model are not generally applicable to underdeveloped countries since they do not apply to conditions found in these countries.

As pointed out in chapter one, a more "workable" extension of the pure theory of trade is needed in order to provide a more useful analytical framework for development problems.

¹R. Nurkse, Equilibrium and Growth in the World Economy (Harvard University Press, Cambridge, 1961), p. 325.

²Grampp & Weiler, op. cit., p. 335.

This thesis then, comes to the general conclusion that the Heckscher-Ohlin trade model in its most common form is not very relevant for developing countries. Indeed, Singer reaches largely the same conclusion when he writes "the principle of specialization along the lines of static comparative advantage has never been generally accepted in the underdeveloped countries, and not even generally intellectually accepted in the industrialized countries themselves".¹

¹H.W. Singer, op. cit., p. 476.

CHAPTER IV

AN EXTENSION OF THE MODEL

1. Introduction

In chapter three, this thesis came to the conclusion that the Heckscher-Ohlin trade model in its static form is not very relevant to developing countries. It will thus be the purpose of chapter four to present a "workable" extension of this model, that is, to relax some of the static and restrictive assumptions upon which the Heckscher-Ohlin theory is based. This will be accomplished both verbally and diagrammatically.

2. A Note on Comparative Statics

Analogous to any other model of pure competition, the pure theory of trade as a piece of abstract logic is not immediately applicable to an explanation of facts. But it serves, as any theoretical model should, as a simple mental picture which isolates particular forces in order to focus on the final position implied. In the pure theory of international trade, this means the state of general equilibrium approached as the dependent variables settle down after an exogenous change. "Thus, one can in principle always find the dynamic sequence implied in any well-defined piece of

comparative statics analysis".¹ Many international trade writers have understood this correspondence especially with respect to the monetary adjustments suppressed in general-equilibrium international trade theory; Taussig is an example who comes immediately to mind. Haberler's classic statement of the transformation curve also gave recognition to the underlying dynamics. Its shape "will vary according to the length of time which is supposed to elapse between the old situation . . . and the new . . . The longer the time allowed for production to adapt itself, the flatter will be the curve".² Haberler goes on to explain this in terms of the wearing out of capital, the retraining of labour, etc. This relation between statics and dynamics, however, is also frequently misunderstood. Balogh, for example, argues in one of his many polemics against the conventional use of comparative statics in international trade that such arguments are invalid because the final equilibrium approached is not independent of the adjustment path taken and the events occurring along the way.³ Balogh is right about the final position implied by one change being altered if another change takes place, but this does not prove that statics is necessarily

¹R.E. Caves, Trade and Economic Structure (Cambridge, Mass.: Harvard University Press, 1960), p. 243.

²G. Haberler, Theory of International Trade: With its Application to Commercial Policy (New York, Macmillan Co., 1950), p. 179.

³T. Balogh, "The Concept of a Dollar Shortage", Manchester School of Economics and Social Studies, Vol. XVII (June, 1949), pp. 186-201.

wrong or useless. It proves rather (1) that comparative statics gives wrong answers when it fails to take into account all relevant data, (2) that in fact economically significant changes often occur steadily through time, forcing us to think not about the final position implied by any one of them, but of the state they will engender in the system at any particular time. It is the presence of overlapping sequences of cause and effect in international trade which requires explicit dynamic analysis.

With the progress of time, the resource base of national economies changes, technology advances, productive factors move internationally, consumers' tastes and preferences change, terms of trade shift, and levels of economic activities fluctuate with disparate rates of growth of resources.

In short, certain assumptions of the model must be relaxed when the process of change is introduced. (Two of the postulates - perfect technical substitutability of productive resources and price flexibility - can be relaxed without reference to the element of time.)

These changes will affect the trade behavior of nations, levels of domestic economic activity, the organization and methods of production, and levels of consumption and economic welfare.

If the change is what Harrod would call a 'once-over-change', or an autonomous change that is due to purely exogeneous factors, the familiar tools of comparative statics

can still be used to offer an adequate explanation of the equilibrium in international trade.

This more modest approach "should still carry us quite a way in clarifying the international economics of development".¹

Classical trade theory does not exclude changes in the supply of factors and other data over time, "but it does insist that under perfect competition the effects of such changes will be reflected in the market mechanism".² If, on the other hand, "we take comparative advantage as a principle of planning rather than as a result of market forces, we can include any foreseeable exogenous changes in technology, tastes or other data without going beyond the framework of comparative statics".³

It should be pointed out that a particular change depends not only on the passage of time but on other variables in the system as well. For example, the rate of increase in productivity of labour in an industry may depend on an increasing level of production in that industry. Some of these dynamic elements can also be analyzed by methods of comparative statics if our purpose is only to choose among alternative courses of action.

In order to be able to determine the comparative

¹G. Meier, op. cit., p. 4.

²H. Chenery, op. cit., p. 22.

³Ibid., p. 22.

advantage in a growing economy we must take into account the following complications: (1) the possibility of structural disequilibrium in factor markets; (2) the inclusion of indirect effects of expanding a given type of production; (3) allowance for variation in the demand for exports and other data over time.¹

If we take these changes into account then we destroy the simplicity of the classical system, "in which allocation decisions can be based on a partial analysis because adjustments in the rest of the economy are reflected in equilibrium market prices".² In a dynamic analysis, it may not be possible to state that a country has a comparative advantage in producing steel without specifying also the levels of production of iron ore, coal and metal-working over time. In short, we are forced to compare alternative patterns of growth rather than separate sectors, and we cannot expect to find simple generalizations of the Heckscher-Ohlin type concerning the characteristics of individual lines of production".³

Chenery concludes, "since there is no well-developed body of theory concerning the formal properties of the above system we can only indicate in a general way the modifications

¹Ibid., p. 23.

²Ibid., p. 23.

³Ibid., p. 23.

needed in the analysis of comparative advantage."¹

It is generally known that costs of labour and capital in underdeveloped countries do not reflect their opportunity costs with any accuracy because of market imperfections. Certain types of labour may be overvalued while specific skills are undervalued. Chenery points out that factor costs may change markedly over time as a result of economic development, "so that an advantage based on cheap labour may prove quite limited in duration".² As Lewis shows, the effects on comparative advantage of correcting for disequilibrium factor prices are often very substantial.³

Two main arguments often stated against the trade pattern produced by market forces concern (1) the fluctuating nature and (2) the low income and price elasticities of the demand for primary products. The income and price elasticities vary considerably among primary commodities.⁴ Their net effect on the terms of trade of primary producers over time is a matter of dispute.⁵ These characteristics are often

¹Ibid., also in Trade and Economic Structure, Caves shows that attempts to introduce dynamic elements have been concerned mainly with particular aspects and have led not to new principles, but rather to extensions of static results.

²Chenery, op. cit., p. 23.

³W.A. Lewis, "Economic Development with Unlimited Supplies of Labour", Manchester School of Economic and Social Studies, No. 2 (May, 1954), pp. 139-191.

⁴Chenery, op. cit., p. 23.

⁵Viner, "Stability and Progress: The Poor Countries Problem", Stability and Progress in the World Economy, Edited by D. Hague, London: Macmillan, 1958.

used as an argument for reducing specialization in underdeveloped countries and for expanding industry for local consumption rather than expanding primary exports.¹ "These factors can be admitted without seriously modifying the principle of comparative advantage."² The market value of the stream of "export earnings should be reduced to reflect the drawbacks to the economy resulting from its variable characteristics, and this social value should be used in comparing investment in primary exports to other alternatives".³ Chenery suggests that when export demand "has a low elasticity, marginal revenue should be used in place of average revenue".⁴ One should not conclude from this analysis that continued specialization in primary exports may not be the best policy, because even the corrected return on exports may be greater than that on alternative investments.⁵

T.H. Williams,⁶ has long recognized the possibility of increasing efficiency as labour and management acquire more

¹R. Prebisch, "Commercial Policy in the Underdeveloped Countries", American Economic Review Proceedings, XLIX, No. 2 (May, 1959), pp. 251-273.

²H. Chenery, op. cit., p. 23.

³Ibid., p. 24.

⁴Ibid., p. 24.

⁵Ibid., p. 24.

⁶T.H. Williams, "The Theory of International Trade Reconsidered", Economic Journal, June 1929, pp. 195-209, Reprinted in American Economic Association Readings in the Theory of International Trade, Illinois, Richard D. Irwin, Inc., 1950, pp. 253-271.

experience in actual production. Indeed, this forms the basis for the infant industry argument. The argument has been generalized to include the effects of increasing production in any industry on the supply of skilled labour and management available to other industries. Chenery once again suggests that since productivity change is an important factor, we should measure comparative advantage over time.¹

Since dynamic external economies are received by an industry from cost reductions or demand increases in other sectors, "the customary analysis of comparative advantage on a sector-by-sector basis would require that the cost reduction from simultaneously developing interrelated sectors be allocated separately to each."²

Cost reductions generally result from economies of scale, productivity increases, or new technology. As shown by Chenery,³ any structure of equilibrium prices may not be an adequate guide when economies of scale are present. Chenery maintains that there is evidence to suggest that, due to internal economies of scale, high demand elasticities and training effects, external economies are of greater importance in the industrial sector than in the primary producing one. He goes on to state that if external economies are omitted

¹H. Chenery, op. cit., p. 24.

²Ibid., p. 24.

³H. Chenery, "The Interdependence of Investment Decisions" in Abramovitz et al., The Allocation of Economic Resources, (Stanford, 1959).

from the market mechanism a bias of resource allocation against manufacturing will result. He concedes however that the "quantitative significance of this factor is hard to determine".¹

The limited ability of policy makers to foresee changes in demand and supply conditions puts a premium on flexibility in the choice of a development strategy.² This factor not only argues against "specialization in one or two export commodities but it also favors the development of a diversified economic structure which will enable the economy to shift to new types of exports or import substitutes when changing trade conditions may require them".³ Kindelberger regards this factor as the main explanation for his finding that the terms of trade have in fact favored developed countries. He concludes, however, that they have not in general favored countries exporting manufactured goods.⁴ Chenery states, "optimum development policy should result in a pattern of resource allocation that allows for unforeseen changes in supply and demand conditions even at the cost of some loss of short-term efficiency."⁵

¹H. Chenery, "Comparative Advantage and Development Policy", The American Economic Review, Papers and Proceedings, Vol. LI (March, 1961), p. 25.

²Ibid., p. 25.

³Ibid., p. 25.

⁴C.P. Kindelberger, The Terms of Trade: A European Case Study (New York: John Wiley & Sons, 1956), pp. 229-253. This argument is further discussed by Caves, R.E., op.cit., pp. 264-266.

⁵H. Chenery, "Comparative Advantage and Development Policy", A.E.R., Papers and Proceedings (March, 1961), p. 25.

3. An Extension of the Model

Development problems can be analyzed by interpreting a country's development in terms of outward shifts in its production frontier. These shifts can be traced to changes in factor supply, techniques of production and labour efficiency. Each change has a production and consumption effect which together cause shifts in a country's offer curve. The overall strength of the combined production and consumption effects will determine the direction and extent of the shift in each country's offer curve, and thereby the changes in the volume and composition of trade that will result from particular types of factor accumulation, technological progress, and increased labour efficiency.

Interest in the effects of technical change on comparative cost, the volume and terms of trade, and the gains from international specialization is of relatively modern origin, a by-product of post-war concern with the 'dollar shortage'¹ and the alleged long-run adverse trend of the terms of trade² of the primary-producing or under-developed countries. More fundamentally, it reflects a growing awareness of the importance of technology among the causes of the wealth of nations, and of technical change among the causes of economic progress and economic change.

¹See E. Mishan, "The Long Run Dollar Problem: A comment", Oxford Economic Papers, N.S., Vol. VIII (September, 1956), pp. 215-220.

²H.W. Singer, op. cit., p. 478.

Technical change raises a variety of problems in the theory of international trade, according to the context in which it is considered. Thus there is the problem of the costs of adjustment to the new pattern of comparative cost conditions created by technical change, and the distribution of the adjustment costs between the country in which the change occurs and its trading partners; the problem of the effects of technical change on domestic employment levels and international monetary equilibrium under Keynesian conditions; the problem of the effects of technical change on the volume and terms of trade and the economic welfare of trading countries under long-run classical full employment conditions; and the problem of the effects of continuing technical change on the pattern of trade and the extent and distribution of the gains from international specialization.

In his contribution Professor Hicks¹ advanced the proposition that in a two-country model with one economy growing and the other static and in which each country produced exports and import-substitutes a general increase in productivity must, except in freak cases, turn the terms of trade against the country in which productivity increased. He then distinguishes between productivity increases in the exporting industry ('export-biased' productivity change) and the productivity increases in the import-competing industry

¹J.R. Hicks, "An Inaugural Lecture: The Long Run Dollar Problem", Oxford Economic Papers, N.S., V. (June, 1953), pp. 121-126.

('import-biased' productivity change) and argued that export-biased productivity change must turn the terms of trade in favour of the rest of the world, but that per contra import-biased productivity change must turn them against the rest of the world, damaging the latter's gains from trade and reducing its welfare.

The broad outlines of the logic of the theory can be summarized as follows. A technical change in one country will tend to benefit or harm the rest of the world according as it increases or decreases the progressing country's demand for imports at the initial terms of trade, so requiring an adverse or favourable shift of its terms of trade to restore equilibrium. The direction and extent of the required shift in the terms of trade is determined by the direction and magnitude of the change in the progressing country's demand for imports and the elasticities of the reciprocal demand curves, and the gain or loss of welfare to the rest of the world is roughly measured by the change in the cost of its initial volume of imports. If the restoration of equilibrium requires an adverse movement of the progressing country's terms of trade, this is an offset to the increased productive capacity resulting from the technical change, which may in the extreme more than wipe out the gain in productive capacity from the technical change.

At this point we define technical change in an industry as neutral, intensive-factor-saving, or intensive-factor-using, according as it would leave unchanged, reduce,

or increase the ratio of the factor used intensively in that industry to the other, at the technical-change factor-price ratio. We also recall that the increase, in the relative price of the factor used intensively in the improving industry, required to restore equilibrium after the technical change, leads to substitution against that factor in both industries, lowering the optimal ratio of that factor to the other in both industries.

It follows that a neutral or intensive-factor-saving technical change must lower the optimal ratio of the factor used intensively in the industry where the change occurs to the other factor in both industries. To reconcile these lower factor ratios with employment of the factor endowment, some of both factors must be shifted to the industry with the higher ratio of this factor -- the industry in which the change occurs. This implies an absolute reduction in the output of the other industry, in which no technical change has occurred, since the factor used intensively in that industry, of which less is now employed there, has a lower average product than before, owing to the reduced ratio in which the other factor is combined with it. In other words, a neutral or intensive-factor-saving technical change increases the output of the industry in which it occurs by more than the total increase in the output of the two industries combined.

It may be noted in passing that in extreme cases technical change in the exporting industry may lead the country to specialize completely in its export industry, elim-

inating the domestic production of importables, and technical change in the industry producing importable goods may lead to a reversal of the direction of international specialization.

The argument set out can easily be extended to allow for relaxations of the restrictive assumptions of the Heckscher-Ohlin model, though such modifications are better handled by explicit mathematical analysis. Increasing or decreasing return to scale respectively accentuate or mitigate the changes in relative factor prices and production pattern resulting from technical change.

A more interesting extension of the Heckscher-Ohlin model, and one more relevant to the problems of trade in a developing world, is to relax the assumption of fixed factor supplies. Factor supplies may be variable either because factors are internationally mobile, or because a country's stock of factors is responsive to factor earnings, as will be the case with capital and may be the case with labour. If factor supplies are perfectly elastic at the initial real prices, the new international equilibrium after the technical change must entail a reduction in the relative price of the commodity produced by the industry in which the change has occurred, by the amount of the cost saving due to the technical change. Abstracting from the complications that international factor mobility introduces into the concept of national economic welfare, this implies that the rest of the world must gain or lose according as the change occurs in the exporting or import-competing industry.

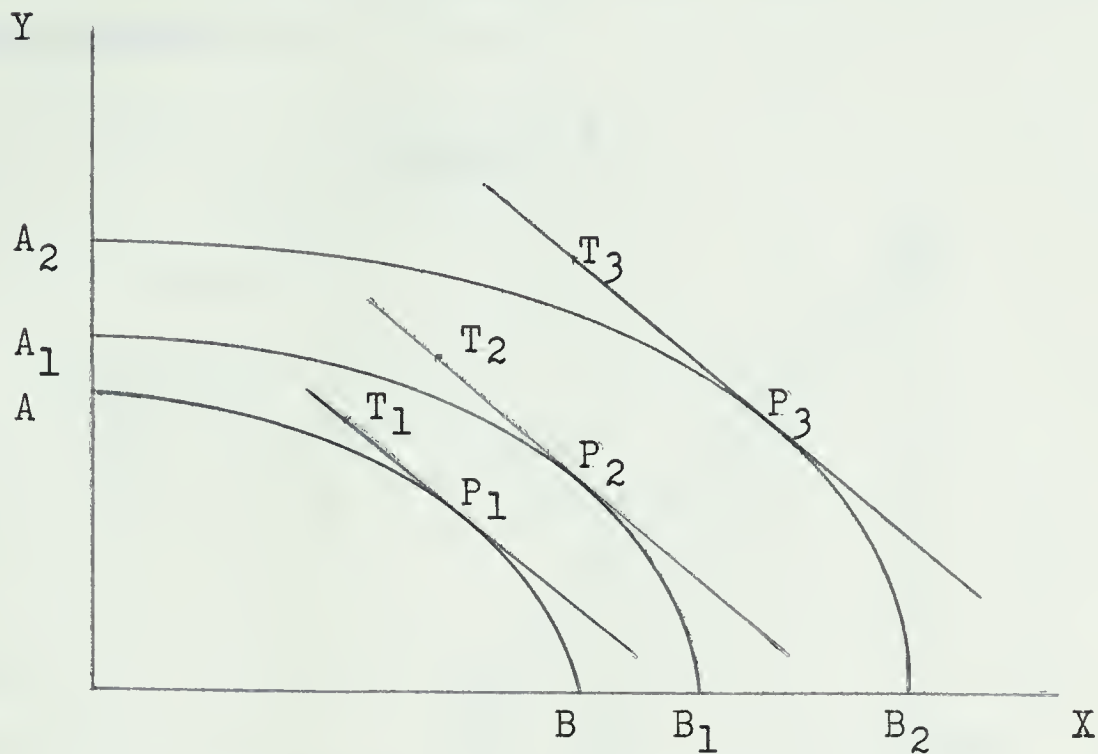
Perfect elasticity of factor supplies, national or international, is not a very interesting assumption. A more applicable assumption is that factors are internationally immobile but that national factor supplies may be responsive to price. Two extreme cases seem especially relevant to the problem of the influence of technical change on international trade in a developing world: perfect elasticity of domestic supply of capital at a given interest rate, and perfect elasticity of supply of labour at a given real wage. These may be taken as typifying the long-run characteristics of advanced and underdeveloped countries, as these have been treated in the literature.¹

We will now relax the rigid assumptions of the traditional model and illustrate diagrammatically five specific cases.

Diagram 6 drops the assumption of fixed quantity of resources and given state of technology. The upward shift of the production opportunity curve and the relatively higher rate of growth in the X industry reflect the development of new resources and technological change. Under the simplifying assumption that the international terms of trade remains constant, the shift of the production point over time from P_1 to P_2 and from P_2 to P_3 and the movement of the point of final equilibrium from T_1 to T_2 and from T_2 to T_3 showing the effect of growth on the pattern of international

¹H. Lewis, op. cit., pp.145-161.

Diagram 6



trade and economic welfare may still be sufficiently analyzed within the framework of comparative statics. International equilibrium requires as before¹

$$MRTS_{xy} = \frac{P_y}{P_x} \dots \dots \dots (1)$$

$$\frac{P_y}{P_x} = MRCS_{xy} \dots \dots \dots (2)$$

$$E = M \dots \dots \dots (3)$$

and the convexity of community indifference curve and concavity of the transformation curve would determine stability of equilibrium as in diagram 6.

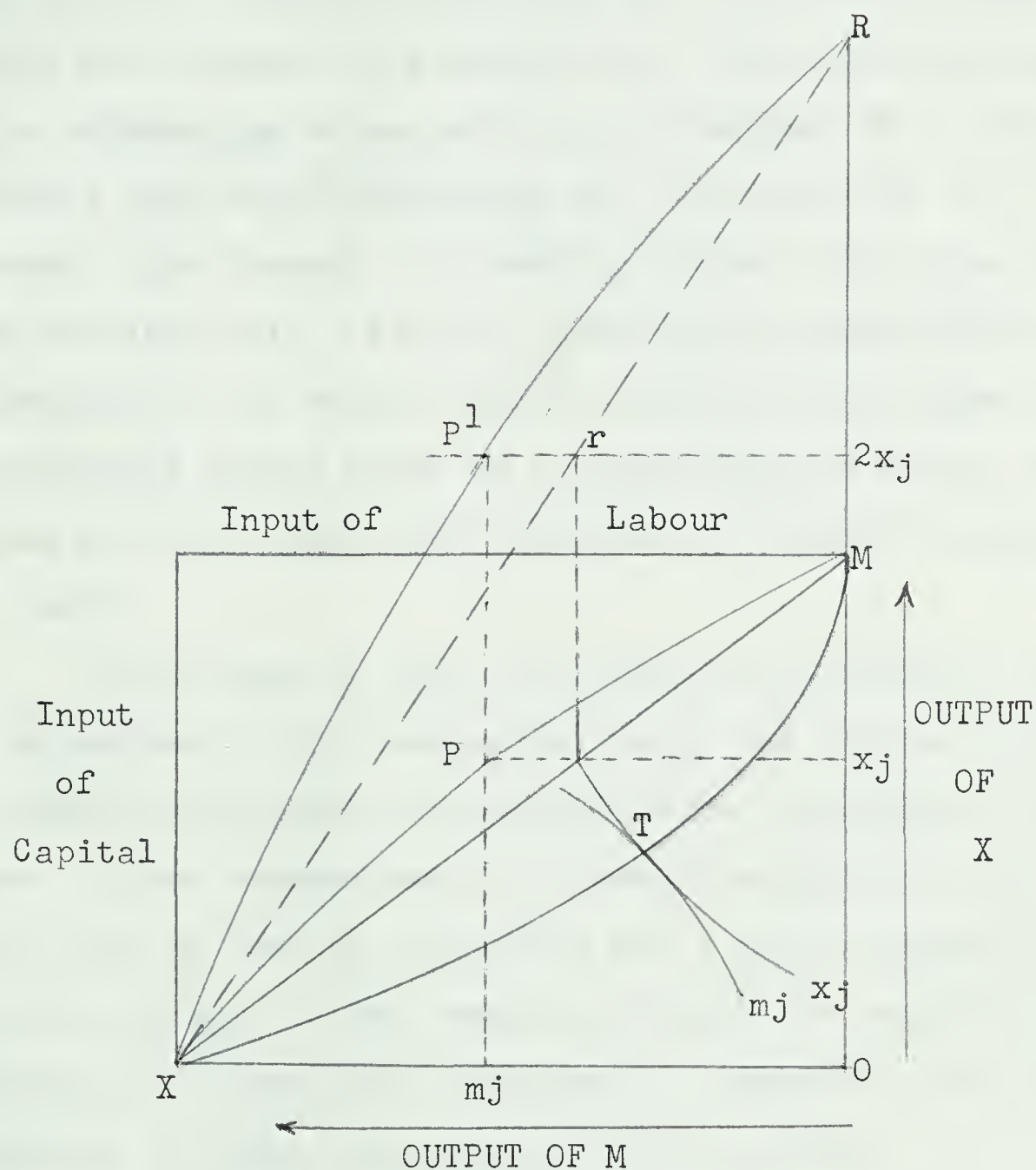
Savosnick² points out that the box diagram can be used to illustrate the effects of factor-neutral productivity

¹See pages 31, 32, Chapter 2, supra.

²K. Savosnick, "The Box Diagram and the Production Possibility Curve", Ekonomisk Tidsskrift, Vol. 3 (September, 1958), p. 191.

increases, (in one or both commodities) upon the production possibility curve.

Diagram 7¹



In Diagram 7 XPM is the production possibility curve before the productivity increase. We then assume that the productivity of both factors doubles in commodity X but

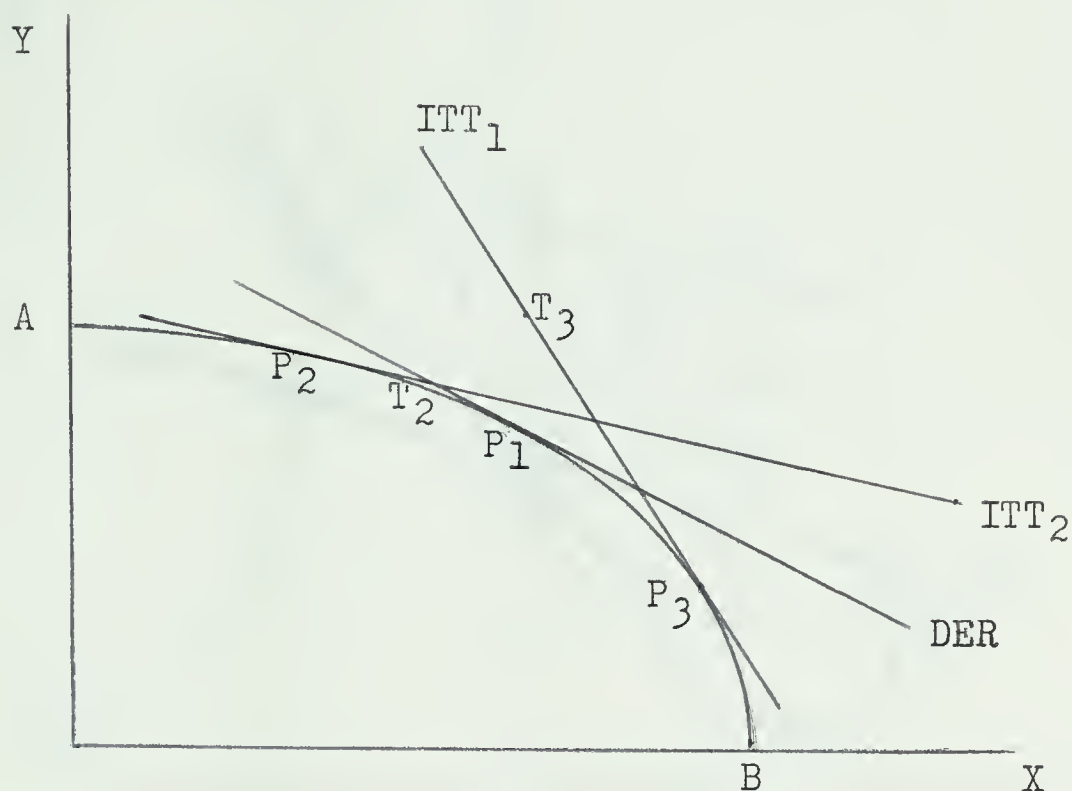
¹From K. Savosnick, "The Box Diagram and the Production Possibility Curve", Ekonomisk Tidsskrift, Vol. 3 (September, 1958), p. 191.

remains constant in commodity M. The shape of the output isoquants for X remains constant. The effects of the productivity increase are projected on the vertical output axis by the aid of a straight ratio line XR; the slope of which reflects the increase in productivity. Thus, from the intersection between the x-isoquant x_j and diagonal XM is now drawn a vertical line which intersects the ratio-line XR at r. A horizontal line through r is used to project the output of X on the vertical axis. With the doubling of productivity in X the isoquant x_j now stands for the quantity $2x_j$. Point p^1 in the coordinate system based on O represents the output combination $m_j, 2x_j$, which now corresponds to point T on the contract curve.

Each point on the new production possibility curve XP^1R is derived in the same manner as p^1 and the two production possibility curves can now easily be compared with one another. Given assumptions as to demand conditions, this approach can be used to illustrate how a factor-neutral productivity increase in one commodity alters the equilibrium combination of output and consequently alters the equilibrium combination of input and relative factor prices.

Diagram 8 illustrates the effect of shifts in international terms of trade on the pattern of trade, production and economic welfare. In this situation also, the marginal and total conditions of equilibrium and stability are applicable as in the classical situation. One interesting possibility may be noted as a special case. If the new inter-

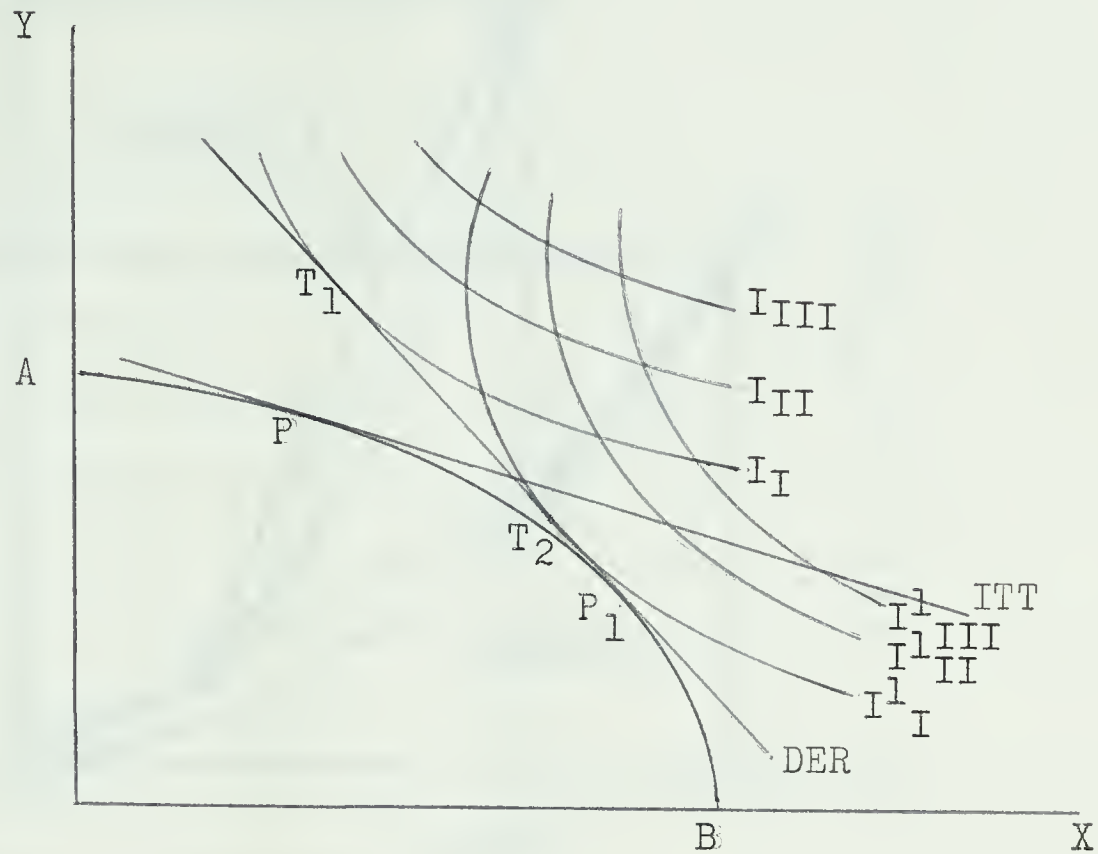
Diagram 8



national terms of trade line ITT_2 shifts in such a manner that the trading point T_2 is to the right of the production point P_2 , the structure of foreign trade will change in that the country in question will import the commodity X rather than export it. In other words, international comparisons of cost structures alone cannot explain the composition of trade without reference to the terms of trade.

In diagram 9 the assumption of a given pattern of consumer tastes and preferences is discarded. The intersecting consumers community indifference curves reflect structural changes in consumer behavior. Once again, under the simplifying assumptions of unchanged technology and terms of trade, it can be shown that although the location of the points of final equilibrium will shift, the conditions of

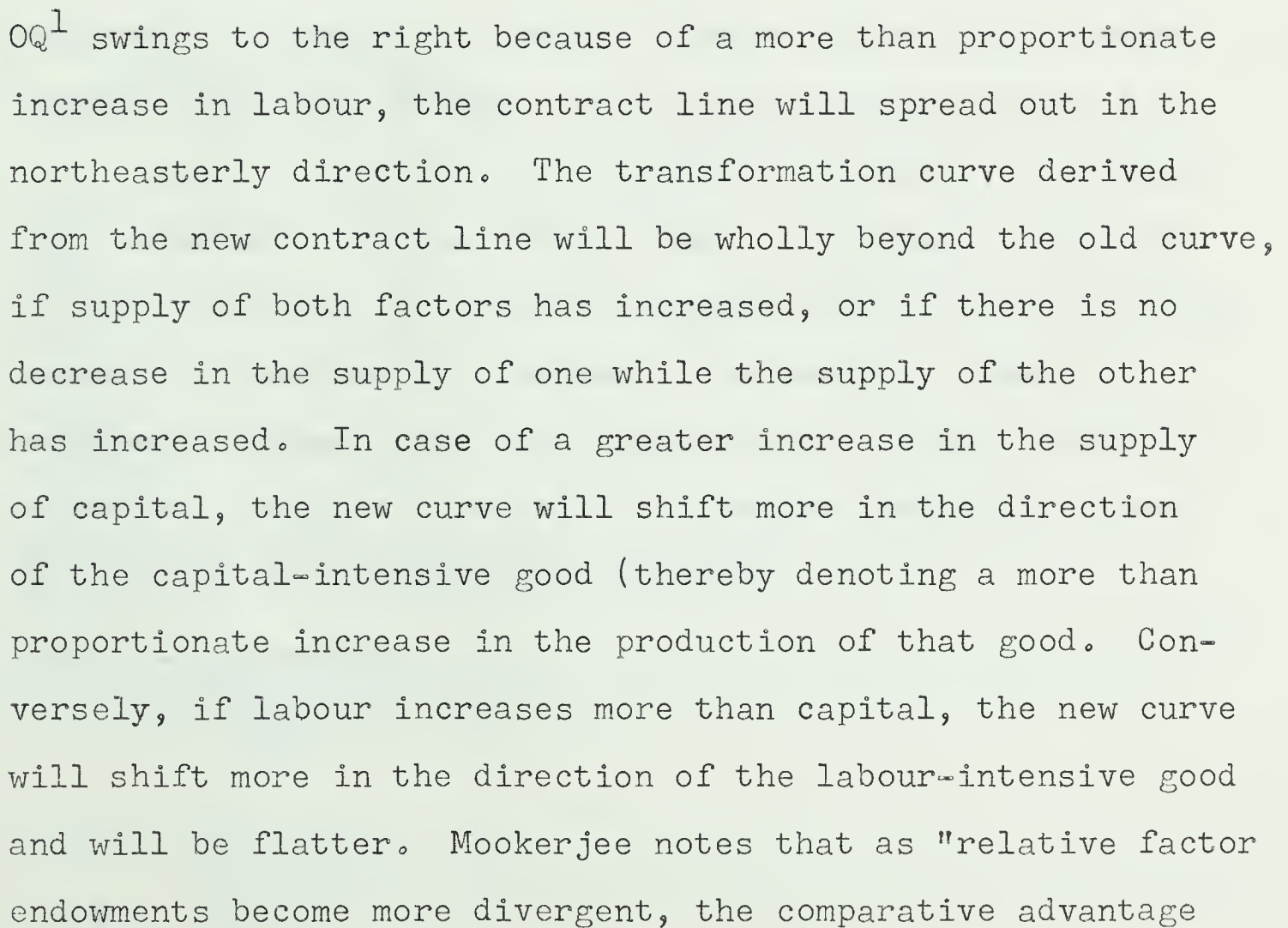
Diagram 9



equilibrium may still be stated in terms of marginal rate of technical substitution, international price ratios, MRCS and finally the slope of the transformation and indifference curves.

Finally, suppose that supply of factors is changed in a country over a period of time. We are here only concerned with non-proportional changes in factor supply, that is, with a shift in the diagonal of the production box. In Diagram 10,¹ if the diagonal OQ^1 shifts to the left as a result of a more-than-proportionate increase in capital supply in country II, the contract line will move up in the northwesterly direction, resembling more closely the contract line of country I. If

¹Mookerjee, op. cit., p. 32.



in production increases".¹

By proceeding from the purely static framework to the method of comparative statics, we have reached a stage where we could now specify how various possible changes in demand conditions, factor supply, and inventions cause the offer curves to shift. Once the offer curve shifts, we are confronted with two questions in regard to long period aspects of international trade, 1) how do the value and composition of trade change through time and 2) how do the terms of trade vary over the long run. Neither of these questions will be discussed in this chapter.

Whether much has been added to economic theory by the emphasis on the dynamic aspects of comparative advantage may remain a subject of debate. There can be little doubt, however, that the sharper focus on the dynamic aspects has had a healthy impact on considerations of policy in developing countries. For one thing, there is a greater awareness of the importance of taking the export sector explicitly into account in development programs. For another, there is a heightened concern with the consequences that may accrue to economies lacking a capacity to transform their structures in the face of changing world markets.

¹Ibid., p. 53.

CHAPTER V

POLICY CONSIDERATIONS AND CONCLUSION

1. Introduction

This final chapter is intended to serve two purposes. The first is to consider comparative advantage as a principle of planning. In this section on resource allocation the factor intensity criterion will be of principal interest. The second is to give a brief concluding discussion of procedures which tend to emphasize comparative advantage in development planning.

2. Resource Allocation

The development of an adequate theory is only the initial step in formulating economic policy. In order to reach practical conclusions, it is also essential that the environment in which the policy-maker functions be specified. Relevant aspects of a particular society include its general objectives, the policy instruments to be considered, and the information generally available. "The theory must then be combined with these elements in such a way as to yield guides to action or 'decision rules' for particular situations."¹

¹H. Chenery, "Comparative Advantage and Development Policy", op. cit., p. 25.

The framework for policy analysis as outlined by Tinbergen¹ and Frisch² has had little impact on the discussion of the development of underdeveloped countries. Since the data needed for over-all economic analysis is available to a limited extent in underdeveloped countries, "there has been a considerable effort to derive decision rules or 'investment criteria' that can be based on partial analysis".³ Chenery groups the various suggestions into three categories: 1) factor-intensity criteria; 2) productivity criteria; 3) programming criteria based on accounting prices.⁴ This section will deal mainly with group one, since the factor-intensity criteria is most closely associated or derived from the Heckscher-Ohlin theory.

Although these various approaches often lead to contradictory results, each has some merit as a form of decision rule if properly qualified. Generally, the theoretical formulations require much more detailed information and thus must be replaced by approximations when necessary data are not available.

¹J. Tinbergen, Economic Policy: Principles and Design (Amsterdam, North Holland Publishing Co., 1956).

²R. Frisch, A Method of Working out a Macroeconomic Plan Frame with Particular Reference to the Evaluation of Development Projects, Foreign Trade and Employment, (Oslo, D. Reidel Publishing Co., 1958).

³H. Chenery, "Comparative Advantage and Development Policy", op. cit., p. 26.

⁴Ibid.

According to Chenery the simplest approach to any allocation problem is "to concentrate on the scarcest resource".¹ Since this is often capital in underdeveloped countries, it seems reasonable to choose the technique that uses the least capital to produce a given output. The same logic is applied to the choice of sectors of production: an underdeveloped country is usually advised to produce and export commodities that use relatively less capital per unit of output and to import items requiring more capital. Buchanan² was one of the first to state this rule for investment in underdeveloped countries and to base policy recommendations upon it.

A closely related allocation criterion is the capital intensity: the ratio of capital to labour. This test is derived directly from the Heckscher-Ohlin version of the comparative cost doctrine.³ If the same production functions exist in all countries and if capital is scarce relative to labour in the underdeveloped countries, comparative advantage in the latter can be identified by low capital-labour ratios. This approach does not assume that labour has zero opportunity cost, as does use of the capital-output ratio, but only that the ratio of labour cost to capital cost is

¹Ibid.

²N.S. Buchanan, International Investment and Domestic Welfare (New York: H. Holt and Co., 1945), p. 98.

³H. Chenery, op. cit., p. 27.

lower than in the country's trading partners.¹ Chenery objects to the use of either of these ratios since they both ignore other factors of production, chiefly natural resources.

He states that if we judge comparative advantage by the capital-labour ratio we make two assumptions. First, we assume that this ratio will be the same for the same industry in all countries or secondly, that capital is equally substitutable for labour in producing all the commodities traded.² If we deviate from the above assumptions, along with the omission of other inputs, then the capital-labour criterion at best becomes a very crude approximation to a proper estimate of comparative advantage.³

It might be noted that the linear programming approach provides a convenient link to the principle of comparative advantage because the optimal pattern of trade is determined simultaneously with optimum allocation of investment.

3. Comparative Advantage in Development Programs

Development programs generally confront two sets of problems. In the short run, "progress is hampered by structural disequilibrium in factor markets and in the demand and supply of particular commodities".⁴ Balance of payments

¹Ibid., p. 27.

²Ibid., p. 27.

³Ibid., p. 28.

⁴Ibid., p. 41.

problems often found in low-income countries embarked on the process of development, usually reflect this disequilibrium. In the long run, the choice among sectors becomes increasingly important because the pattern of growth in each period will depend on the choice made previously.¹ Development programs that are influenced mainly by the existing structural disequilibrium therefore tend to stress the need for greater balance between domestic demand and supply, while those that take a longer view tend to pay more attention to comparative advantage.²

Characteristic elements of the comparative advantage approach are attempts to measure the relative efficiency of different types of production, the weighting of balance-of-payments improvements against other benefits to the economy, and usually a greater emphasis on partial analysis than on over all projections.³ Examples here are Puerto Rico and Israel.

"Among countries having development programs, procedures that stress comparative advantage are less common than those emphasizing balance."⁴ Practically all policy statements list among their priority criteria factors presumably leading to comparative advantage, "but there is little

¹Ibid., p. 41.

²Ibid., p. 41.

³Ibid., p. 41.

⁴Ibid., p. 44.

evidence as to how they are applied in drawing up programs".¹

The development procedures of the government of Puerto Rico came close to being a pure application of comparative advantage. Unlike many low income countries, Puerto Rico has an elastic demand for its exports to the U.S. market and can attract U.S. capital for profitable investments.² The government of Israel had developed a very systematic process for measuring comparative advantage as a basis for the allocation of investment funds.³

It is often dangerous to generalize from the limited evidence on development policies that is available, nevertheless it can be said, that small countries are forced to pay more attention to comparative advantage because they cannot hope to produce the whole range of manufactures and primary products, while large countries may be tempted to follow more autarchic policies.⁴ Japan may be cited as being an exception to this generalization, partly because it depends on imported raw materials.

Conclusions

"Much of the attack on the use of comparative advantage is based on its omission of various non-market elements."⁵

¹Ibid., p. 44.

²Ibid., p. 45.

³Ibid., p. 45.

⁴Ibid., p. 46.

⁵Ibid., p. 47.

It is assumed that the inclusion of the latter favors the development of industry, and special benefits are often attributed to capital goods and heavy industry.¹

Chenery concludes, "the commodities to be produced and traded cannot be determined by a simple ranking procedure along the lines of comparative advantage because of the interdependence among sectors."² At best, it may be possible to say, for example, "that a country has a comparative advantage in steel production for a specified set of production levels in supplying and using sectors."³ In advanced countries, "this qualification may be unimportant, but in the less developed ones it is crucial in a number of industries".⁴

To conclude, as Meier maintains, "the traditional theory of international trade, when suitably extended has some relevance for every developing country, whether rich or poor . . .".⁵

¹Ibid., p. 47.

²Ibid., p. 47.

³Ibid., p. 47.

⁴Ibid., p. 47.

⁵G. Meier, op. cit., p. 5.

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